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THE maintenance of a certain device on a locomotive costs 2.6 times as much per mile on one road as it does on another in the same territory and operating under similar conditions. The design of the apparatus and the service to which it is subjected is much the same on both roads. On the one which has the low cost of maintenance the percentage of the cost charged to labor is about 80 per cent., and that to material about 20 per cent. On the other road the labor charge is approximately 35 per cent., and the material charge 65 per cent. The conclusion is obvious. The first road watches its equipment closely and adjusts or repairs the various details as soon as they show signs of wear or failure; the other road lets things go until it is almost impossible to operate the locomotives without repairing them. A superintendent of motive power was criticized because his locomotives looked so much better than those of his neighbors, the inference being that he wasted money to keep them clean. Investigation showed that his unit costs were lower than those on the other roads—apparently because in keeping the locomotives clean and neat defects were discovered and remedied before they reached a serious stage. It is a short-sighted policy that will permit a piece of equipment, known to be in defective condition, to run until it actually fails, possibly causing a tie-up on the road, and costing many times what it would to have maintained it in good condition.

A LETTER, commenting on the work of the government safety appliance inspectors, was published in our issue of February 7, 1913, page 237, in which the following statement was made:

"Recently the equipment in the yards of a western railway was inspected by a government safety appliance inspector. The inspection occupied one hour and was finished at 9 a. m. After it was completed the inspector was asked if he intended to inspect the equipment in the yards of another railway located in the same town, and about fifteen minutes' walk from the yards in which the inspection had just been made. He replied that the inspection of one yard was considered a day's work in government service, and that no inspector went over more than one yard in one day; he would, therefore, save the other yard for another day's work."

This letter was sent to us by a correspondent on a western road with the understanding that his name should not be used in connection with it. The letter was used as copy for the printer and has since been lost, or destroyed, together with other copy, which it is our practice to hold for only a week or two after the date of publication. The Interstate Commerce Commission has asked us to furnish it with the name of the writer of the letter or of the inspector referred to. This we are unable to do. We, therefore, take this opportunity of complying with the following request of the commission: "The commission feels, however, that you should either furnish the name of the writer of the article or that of the inspector, or else publish in the *Railway Age Gazette* a statement to the effect that when the commission called attention to this article and asked for the name of the writer that the party in question refused to make his name known or to furnish the name of the inspector involved, thus affording the commission no opportunity whatever of proving or disproving the charges made by him, such statement to be given the same publicity as was the article which has resulted in this correspondence."

ILLINOIS is one of the states which still have no anti-pass law. An anti-pass bill is now pending in the state legislature. Doubtless the railways of Illinois should have combined to stop the giving of state passes before this. There are two reasons why they have not done so. One is that so long as the giving is not illegal there will always be a few railway men who will be disposed to continue it in the hope that it will have some tendency to mitigate the severity of railway regulation. The second reason is that as long as the issuance of passes is legal many legislators and other public officials will insist on having them and will resort to all sorts of blackmailing devices to get them. In many cases they obtain them not only for their

own use, but that of others. The story is told of a certain representative of the people of Illinois who a short time ago gave a card party at which the prizes were passes over different railways. The issuance of passes costs the railways a good deal of money. Of much more importance is its demoralizing influence on public affairs. There is an impression that railway officers are opposed to anti-pass legislation. This as to most railway officers is entirely erroneous. The giving of passes is far less frequently an attempt on the part of the railways at improper influence than a successful attempt on the part of those who receive them at blackmail. However, regardless of who wants to give passes or who wants to get them, their issuance for any purpose or to any class not specified in the Interstate Commerce Act ought to be prohibited by statute in every state. In fact, probably the exceptions in the Interstate Commerce Act itself are too broad and numerous. This corrupting and debasing influence ought speedily to be forever removed from our commerce and politics.

SOME extremely insignificant cases are submitted to the Interstate Commerce Commission, and yet it is its duty to treat such cases as though they were of real significance, to carefully weigh the evidence and to have the decisions printed and distributed broadcast. On another page is abstracted a decision dismissing a complaint in which the complainant sued for a refund of certain drayage charges amounting to $2.50. No precedent was involved which would have a bearing on future outlays of a similar nature, and the injustice of the complaint would be palpable to any school boy. The commission is now performing an invaluable service to the country by handing down decisions in an ever-increasing number of important cases. It is compelled to work at high pressure, and any time spent on cases such as the one above mentioned represents a total loss. The commission's time is valuable and should be jealously guarded. The common courts, through long experience, have found it necessary to protect themselves against absurd suits by charging the loser with costs, but where a complainant before the Interstate Commerce Commission retains its own counsel at an annual salary, the cost of a suit is practically nil, so there is nothing to deter him from filing a complaint, however unreasonable. The commission is essentially a free court, but it should be protected from abuse. The plan for deputy interstate commerce commissioners, outlined in the *Railway Age Gazette* of April 25, page 951, would shield the commission from all save the weightiest cases, but does not provide for the exclusion of obviously unreasonable complaints. Hitherto the number of such cases before the commission has not been large, but it is likely to grow, and the sooner this growth is checked, the better. Though it would not be desirable to make losers of bona fide cases pay the cost, there should be some provision for summarily dismissing unworthy complaints without printed reports, for printed reports in cases of this nature seem to dignify them beyond their just desert. It might also be found advisable to impose fines upon such complainants, leaving it to the commission to decide which cases should be treated in this manner.

THE state's attorney at Bridgeport, Conn., who secured the indictment of President Charles S. Mellen of the New York, New Haven & Hartford on a charge of manslaughter in connection with the derailment which occurred at Westport on that road, last October, announces that the trial will be begun May 27, and that "it will be finished in less than three weeks." Such a trial would be an outrage. The indictment itself is an outrage; but mere indictments are reported so frequently that the spectacle of innocent persons stigmatized by "true bills" has become too common to attract much notice. An indictment is an easy means by which a prosecuting officer, when worried, excited or actuated by political motives, can appease public sentiment until the public—and he, himself—can cool down. No sane magistrate or attorney expects to promote justice by prosecuting a railway president for manslaughter when an engineman makes a mistake. The "friends of the people" who are simultaneously investigating, prosecuting and persecuting Mr. Mellen could be granted all their contentions in this case—that the officers of the road ought to have provided different crossovers, or fireproof cars, or should have had a better qualified engineman, etc.—and still they would have no sufficient ground for the manslaughter charge. The connection between the accident and the causes alleged is so slight and ill-defined that no case could be made which would convince a reasonable jury; for reasonable criminal convictions are based on direct and proximate, and not on utterly indirect and remote causes. Moreover, criminal trials of this sort which have produced any good result are so hard to find that their value, even in the abstract, is very doubtful, if not entirely lacking. Even if it were admitted, for the sake of argument, that a prison sentence would be a just punishment for the railway president who does not follow the acts of his vice-president, general manager, general superintendent, division superintendent, trainmaster or roadmaster and inspector, in sufficient detail to know when a mistake was made in choosing or training a locomotive runner, or in laying tracks, or in issuing speed regulations, there would still be two important questions to answer: (1) whether courts ever impose punishments on a basis like this in other affairs, and (2) whether any useful remedial results have ever been secured by criminal prosecutions for railway disasters due to high speed. With no exceptions of importance, the answers to both would have to be in the negative. A president is, indeed, responsible for the general policy of his company, but no evidence at all has been produced to substantiate the loose claims that the Westport wreck was due to any fault of general policy—unless it be the opinion of Inspector Belnap relative to short crossovers, full stops and automatic train stops, which is without backing from any real engineering authority. The fact is that Mr. Mellen must be tried in Connecticut for causing a collision, just because the accident happened at a time when he was being blamed for problematical freight-rate sins in Rhode Island; and that is not in the interest of good government. What would be the verdict of the ordinary jury if an engineman, a member of a labor union, were tried for manslaughter in a case like this, even though the accident were directly due to failure on his part to obey the rules or orders of his superiors? Judging from the past, the sympathies of the jurymen would set him free. The present prosecution is too plainly actuated by politics, or vindictiveness, or both.

SOME DISPUTED POINTS IN RAILWAY VALUATION.

1.—Right of Way.

THE valuation of railway properties as a basis for rate regulation and taxation has come into great prominence within late years. The agitation of the matter has culminated in the recent passage by Congress of the law providing for a valuation of the railways of the entire country. This action has made the subject one of great importance. Railway officers are confident that the valuation, if fairly made, will prove a means of convincing the public that the railways as a whole are not, as so often charged, over-capitalized. At the same time great care must be taken to see that the work is properly and thoroughly done along lines which will be sustained in the courts.

In the field of the public utilities, enough valuations have been made to enable many of the underlying principles to be established, either by general agreement or by decisions of the courts. Because of the much more limited number of railway valuations that have been made there is a much wider divergence of opinion among both railway men and regulating

authorities regarding many of the important principles and methods.

Six states, Michigan, Wisconsin, Minnesota, Washington, South Dakota and New Jersey, have completed valuations of the railways within their borders since 1900, while Nebraska and Kansas are at present making them. Massachusetts has also made a valuation of the properties of the New York, New Haven & Hartford, while Washington has made a separate valuation of the Spokane & Inland Empire System. The purpose of the valuations in Minnesota, Washington, South Dakota and Nebraska has been the regulation of rates. The New Haven valuation in Massachusetts was made to determine the reasonableness of the capitalization of that road. In Wisconsin the valuation has been used for both taxation and rate regulation. In some few cases the railways themselves, in connection with rate cases, have made valuations in a thorough manner, while in others they have made what have been little more than inventories of their physical properties.

The degree to which the purposes of the valuations have influenced the methods adopted is more or less problematical, but the fact is that wide differences of opinion exist as to the bases on which valuations should be made. One of the most important of these differences of opinion relates to the way that right of way should be appraised. Two prominent conditions have to be considered, the appreciation of railway property in common with other land, especially at terminals, and the greater expense incurred by railways than other purchasers in securing land. The railways have acquired land by gift, by purchase in the ordinary way and by condemnation. Some economists and regulating authorities take the position that the appraisal of land should be based on its original cost to the railway. The question of what weight should be given in a valuation to the increase in the value of a railway's land was raised by the Burlington in the Western rate advance case. Commissioner Lane, in the commission's opinion in that case, did not directly say that the full increase in value of the land should not be considered, but did strongly intimate that it ought not to be. In the valuation in Minnesota the state commission prepared two land appraisals, one showing what it would cost the railways to acquire property for railway purposes at the time of valuation, and the other what it would now cost to acquire it for other than railway purposes, the former being practically $32,000,000, or 1.77 times greater than the second. The commission favored the latter, or present value of the land for general commercial purposes. In New Jersey the valuation was made under an old taxation statute which stipulated that the value of the land be considered without any reference to its use, any additional value arising out of its use for railway purposes being included with intangible values. In Michigan, Washington, Wisconsin and Nebraska, comparisons of large numbers of purchases by railways and by private parties alongside railways were made and the ratios of these purchase prices were applied to the railway right of way, these ratios varying from 15 per cent. in cities in some instances to as high as 1,000 per cent. in rural districts where the value of the land for farming purposes was low. In the Minnesota rate case Judge Sanborn, of the United States Circuit Court, overruled the Minnesota commission, and held that the valuation should have been based on what it would now cost the railways to acquire the land for railway purposes.

The extent to which property held for future use should be included in an appraisal is undetermined. Nearly all roads have acquired property for future development which is at present not essential for the operation of the road, but which may be in future. In Washington all land not likely to be used for railway purposes in the near future was eliminated from consideration, and in this way property belonging to the Northern Pacific and valued at over $15,000,000 was excluded. Similarly, in Nebraska where the Union Pacific owns a right of way 400 ft. in width nearly across the state, the commission has included only a width of 200 ft. in its valuation.

How important is this question of the proper way to appraise land values is indicated by a statement regarding a single road, the Burlington, which was made by the Interstate Commerce Commission in the Western rate advance case. "Out of the difference between the original investment of $258,000,000 and the estimated present value of $530,000,000 it has been estimated that the increase in land values amounts to approximately $150,000,000." The estimated increase in land value was over $15,000 a mile for the entire property.

THE CHANGE IN PUBLIC SENTIMENT IN THE SOUTHWEST.

THERE appears to be a slow but quite real change for the better in the public relations of the railroads in the southwestern states. The most marked change is in Texas. Not only was there no anti-railroad legislation enacted in that state last year, but one bill of a good deal of importance to some of the roads in that state—the bill permitting the merger of certain roads—was passed by the legislature over the veto of the governor. In Oklahoma a full crew bill was defeated, and in Missouri the prospects are good for obtaining a referendum vote on the full crew bill that was enacted by the Missouri legislature. This attitude towards full crew bills in the southwestern states is in marked contrast to the actions of the politicians in New York and New Jersey.

Credit for this more far seeing policy towards railroads in the southwest is due first of all to the Commercial Secretaries' Association of Texas. This body, with the best interests of their state clearly before them, and firm in their conviction, have fought popular prejudice and narrow self-interest, and have today achieved results that are in a considerable measure contributory towards the remarkable present prosperity of Texas.

The daily newspapers have also helped in the work of education. This is of importance, because the newspapers both lead public thought and are a reflection of it.

There is also a certain element among the orders of railroad employees who are frankly recognizing how closely identified their own interests are with the success of their employers. This is possibly more noticeable in Kansas than in Texas, but is a distinctly hopeful sign. The situation in regard to personal injury claims in the southwest is still unqualifiedly bad. Public sentiment towards claims brought by employees against railroad companies for alleged injuries is as lawless as that of the average traveler towards United States custom house declarations. About the only thing that the railroads can do is to spend time and money in making their equipment technically, as well as practically, safe and to keep watch on chronic injury-suffering employees and weed them out of the service.

The citizens of the southwest are free spenders, they know good service and are generally willing to pay for it; their homes are well built, their hotels far above the average, and when they go to Chicago or New York they demand and are not afraid to pay for the best. The attitude of Texans towards their railroads was not so much a contradiction of this appreciation of good service, as an anarchistic disregard for vested interest. As they themselves, however, acquire wealth their respect for property rights is increasing. There is also a growing understanding of the vital connection between all other property values and railroad property values.

Texas is prosperous to an extent never before equalled. Crop prospects are good, building in the cities is active to a remarkable extent, and all classes of people are sharing to a greater or less extent in the fruits of the development of the country. If, therefore, the change in the attitude towards railroad improvement and possible future profitable operation is a lasting change it may well be that business men as well as railroad men of the southwest have this further important basis for prosperity over and above good crops and high prices.

Letters to the Editor.

SLOVENLY WHISTLING.

Oakland, Cal., May 10, 1913.

To the Editor of the Railway Age Gazette:

I have read with interest the article on "Slovenly Whistling" in your issue of March 28. But alleviating the sufferings of the public is not the only issue. The proper use of the whistle signals as prescribed by the book of rules is also important. Their strict observance is a matter of safety, and yet less attention is paid to their frequent misuse than to any other infractions of the rules. The engineman should use judgment in sounding the whistle, taking into consideration the distance the sound is to be carried. Each blast should be as plain as print, with proper spaces between blasts; the longer the distance to be carried, the longer should be the space. The flagman whom he is calling in may be out around a curve behind a hill, and if the blasts are not properly spaced, the echo of one runs into the other, and what the flagman hears is one long blast of the whistle. If a flag is ordered out before the train comes to a stop, as frequently happens, if an unexpected stop is made, especially if on short time ahead of a superior train, the whistle signal for sending out a flag should again be clearly and distinctly sounded after the train stops. If it be a long train, or even one of moderate length, the grinding of the brakes, when applied, may prevent the flagman at the rear from hearing the first signal. If the signal is sounded before the train comes to a stop, it should always be sounded the second time. How frequently on a passenger train when the air-whistle signal has been sounded for the engineman to stop at the next station, the conductor hears one long blast, the result of improper spacing. A passenger train crew running with an engineman who habitually misuses whistle signals, might misunderstand or fail to heed a call for brakes, should such a contingency arise. There should be a vigorous campaign on the proper use of whistle signals on every railroad in the country. Use the whistle as sparingly as is consistent with safety, but use it correctly.

Despatcher.

FUNDAMENTALS OF WAGE PAYMENT.

New York, April 30, 1913.

To the Editor of the Railway Age Gazette:

In your issue of April 25 the very interesting article by Mr. Milner on the "Fundamentals of Wage Payment" treats the subject in an exceedingly able manner but omits some of the important fundamentals and makes one error of considerable weight.

Mr. Milner treats the subject from the standpoint of mathematics and pure logic, while other items must be considered. One very important one is the nature of the business. A method of wage payment that would be perfectly satisfactory on work performed exclusively by hand would be entirely unsatisfactory when applied to machine operations. The equipment necessary for carrying on an industry and the resulting burden charge is of vital importance and must be considered when determining methods of wage payment.

The human element and the vagaries of the human mind must also be considered, and the method of payment must appeal to the workman so that he is stimulated to steadily increase his output up to the maximum attainable. This element is at the foundation of the bonus methods of payment and is largely responsible for their success. For some strange reason the human being is so constituted that he will go after a time record where he will take a little interest in a mere money record. A workman will brag all over a shop that he "beat a schedule," whereas one seldom mentions making a large day's pay.

The neglect of the above considerations and the lack of knowledge of "all methods of wage payments" led Mr. Milner into the error of stating: "Under no system of labor payment does cost per unit of output regularly increase with increases in output or decrease with decreases in output."

One very large plant in this country whose burden charge far overbalances the labor cost uses a piece-work method wherein the price per piece increases with the output. The rate per piece increases within regularly defined limits as follows: 10, 10.5, 11.0, 11.5, 12.0 cents per piece and upwards. This method has proved very satisfactory from the standpoint of both the company and the workmen.

A number of concerns, both in this country and abroad, use a method of bonus payment which increases the cost per piece with increased output. The method used runs about as follows (using Mr. Milner's 10-hour and 30-cent rate):

Time.	Cost.	Rate.
10 hours	$3.00	$0.30
8 hours	3.20	.40
6 hours	3.60	.60

Here again the results obtained are satisfactory from every point of view. However, such methods would not prove at all satisfactory under different conditions and, as stated before, in determining methods of wage payment *all* the elements must be considered.

C. J. Morrison,
Chief Engineer, Froggatt, Morrison & Co.

DESIGN OF UNDERFRAME FOR CARS.

Savannah, Ga., April 26, 1913.

To the Editor of the Railway Age Gazette:

Every once in a while some one attempts to show how to design a steel underframe for cars from a strictly theoretical standpoint, and to show that existing designs are too heavy and that better results with less weight can be obtained by a better, or more scientific distribution of metal.

As a matter of fact, the best designs of steel underframes have been deduced by a process of elimination and substitution based upon the repair track records. The earlier designs, produced from a strictly engineering standpoint, soon developed unexpected weaknesses, and showed a decided lack of a sufficient "factor of ignorance." The stresses which car underframes are subjected to under a severe impact do not readily yield to mathematical analysis, and it is the unfair usage of this nature that we must provide for in our design, and not the normal, measurable stresses.

The communication on page 786, of your issue of April 4, is interesting from a strictly engineering standpoint, but the design is not desirable from past experience. The metal in the center sills required for load and buckling in a vertical plane will be amply sufficient for all buckling stresses in a horizontal plane if the center sills, which are generally composed of two parallel members, have a riveted cover plate. This will not require any more material, if as much, as the diagonal bracing suggested, and involves much less labor in the assembling of the underframe. It is also much cheaper to repair in case of partial destruction in wrecks.

Referring to Fig. 5, the two diagonal compression members shown at the ends are of little or no use, other than bracing the car against a cornering blow. The buckling stresses from compression are distributed by the coupler to the draft sills, well back of the end sills in all types of well designed friction gear, unless in a collision, when the horn of the coupler may come solid on the end sill. Even under this condition, with the tying at the body bolster the center sills should be stiff enough to take a blow between end sill and body bolster that will shear the rivets in the draft sill splice, without buckling. A blow sufficient to shear the rivets at the splice is a destructive blow, and its effects should be dissipated before reaching the body bolster, the damage being confined to as small an area as possible to facilitate repairs. The diagram, to be consistent, and to provide for these conditions, should show compression struts in the panels immediately behind the body bolsters.

The best design of underframe is a matter of vital interest to all mechanical officers of railroads, as well as to car builders, and it would be of interest to have the opinion of others on this matter.

F. F. Gaines.
Superintendent Motive Power, Central of Georgia.

MILEAGE OF RAILROAD BLOCK SIGNALED.

Government Report Showing Not Only a Large Increase in Mileage but Also Extensive Improvement in Details.

The Interstate Commerce Commission has issued its regular annual bulletin of block signal statistics showing the mileage of railroads thus operated on January 1, 1913. The length of road operated under the automatic block system was 22,218.8 miles, and under the manual system, 61,731 miles; total, both kinds, 83,949.8 miles. The details which make up these totals appear in Table No. 1, reproduced herewith.

In five cases considerable lengths of road are operated jointly by two companies, each company owning one of the two main tracks. This makes a small fictitious increase in the aggregate mileage of the country.

The Seaboard Air Line operates its manual block system by telephones, not by telegraph, as was erroneously reported a year ago.

A comparison between the figures now published by the commission and those for the same date given in our own table,

TABLE 1— RAILWAYS WORKED BY THE BLOCK SYSTEM, JANUARY 1, 1913.

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block signaled, miles of track.
	Single track.	Double track.	Three track.	Four track.	Total.		Single track.	Double track.	Three track.	Four track.	Total.						
					Miles of road.	Miles of track.					Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Albany Southern	0.5				0.5	0.5	26.7	16.3			43.0	59.3	43.5	59.8	43.5	59.8	100.0
Ann Arbor							1.0				1.0	1.0	1.0	1.0	292.0	292.0	.3
Arizona & New Mexico	1.0				1.0	1.0							1.0	1.0	109.0	109.0	.9
Atchison, Topeka, & Santa Fe:																	
Eastern Lines	22.2	113.7			135.9	249.6	488.1	495.5			983.6	1,479.1	1,119.5	1,728.7	2,491.2	3,119.5	55.4
Western Lines		2.5			2.5	5.0	552.8	23.8			576.6	600.4	579.1	605.4	2,959.0	2,985.3	20.3
Coast Lines	74.3	53.2			127.5	180.1	4.3				4.3	4.3	131.8	184.4	1,940.8	2,134.8	8.6
Gulf, Colorado & Santa Fe	3.6				3.6	3.6							3.6	3.6	1,668.8	1,668.8	.2
Atlanta & West Point								6.0			6.0	12.0	6.0	12.0	86.0	92.0	13.0
Atlantic Coast Line	2.4	51.1			53.5	104.6	331.9	105.5			437.4	536.1	490.9	640.7	3,822.8	3,960.4	16.2
Auburn & Northern	6.5				6.5	6.5							6.5	6.5	6.5	6.5	100.0
Baltimore & Ohio	14.7	266.7	4.8	16.8	303.0	635.4	1,966.6	718.5	107.0	7.5	2,799.6	3,761.9	3,102.6	4,397.3	3,102.6	4,397.3	100.0
Baltimore & Ohio Chicago Terminal	1.2	14.3			15.5	29.2							15.5	29.2	45.0	72.2	40.4
Baltimore & Ohio Southwestern		24.9			24.9	49.7	901.4	36.5			937.9	974.4	962.8	1,024.1	962.8	1,024.1	100.0
Baltimore & Sparrow's Point							1.7	3.0			4.7	7.7	4.7	7.7	4.7	7.7	100.0
Bessemer & Lake Erie							64.4	130.0			194.4	324.4	194.4	324.4	191.0	320.9	97.2
Boston & Maine	410.4	619.7		2.1	1,032.2	1,658.2							1,032.2	1,658.2	2,219.8	2,773.4	59.8
Boston, Revere Beach & Lynn		13.8			13.8	27.6							13.8	27.6	13.8	27.6	100.0
Buffalo, Rochester & Pittsburgh	2.0	35.1			37.1	72.2	311.7	96.5			408.2	504.5	445.3	576.7	445.3	576.7	100.0
Butte, Anaconda & Pacific	7.9				7.9	7.9							7.9	7.9	25.3	25.3	31.2
Carolina & Northwestern							6.1				6.1	6.1	6.1	6.1	133.5	133.5	4.5
Central New England	13.9	17.5			31.4	49.0	1.5				1.5	1.5	32.9	50.5	276.9	311.1	16.2
Central of Georgia							66.5	7.4			73.9	81.3	73.9	81.3	1,767.3	1,774.7	4.6
Central of New Jersey	13.0	165.5	2.4	31.5	212.4	477.2							212.4	477.2	464.1	742.9	64.2
Central Vermont							396.3	6.2			402.5	408.7	402.5	408.7	402.5	408.7	100.0
Chesapeake & Ohio		454.6			454.6	909.2	1,112.3	21.2			1,133.5	1,154.7	1,588.1	2,063.9	1,612.4	2,088.2	96.3
Chesapeake & Ohio Ry. of Indiana							262.2				262.2	262.2	262.2	262.2	262.2	262.2	100.0
Chicago & Alton	420.7	184.6			605.3	789.9	141.2				141.2	141.2	746.5	931.1	1,025.2	1,209.8	72.8
Chicago & Eastern Illinois		106.2			106.2	212.4	245.0	79.2			324.2	403.4	430.4	615.8	972.7	1,170.3	52.7
Chicago & North Western	39.2	764.5	14.9	7.7	826.3	1,793.0	2,712.1	92.5			2,804.6	2,897.1	3,630.9	4,690.1	7,132.8	8,203.3	57.2
Chicago & Western Indiana		19.5			19.5	39.0		4.6	3.2		7.8	18.8	27.3	57.8	27.3	57.8	100.0
Chicago, Burlington & Quincy	44.6	43.6	4.2	5.4	97.8	166.0	7,895.5	694.9	14.5		8,604.9	9,328.8	8,702.7	9,494.8	8,378.0	9,170.0	100.0
Chicago Great Western	196.9	86.2			283.1	369.3	88.6				88.6	88.6	371.7	457.9	1,470.7	1,566.7	29.2
Chicago, Indianapolis & Louisville	161.9				161.9	161.9	363.0				363.0	363.0	524.9	524.9	578.0	578.0	90.9
Chicago Junction							1.3				1.3	1.3	1.3	1.3	11.8	163.7	.8
Chicago, Milwaukee & St. Paul	2.4	103.7			106.1	209.8	2,909.8	493.1			3,402.9	3,894.9	3,509.0	4,104.7	6,589.4	7,175.8	57.2
Chicago, Milwaukee & Puget Sound	363.1				363.1	363.1	1,535.1				1,535.1	1,535.1	1,898.2	1,898.2	1,953.1	1,953.1	97.1
Tacoma & Eastern							172.8				172.8	172.8	172.8	172.8	172.8	172.8	100.0
Chicago, Peoria & St. Louis Ry. of Ill	1.3				1.3	1.3	247.2				247.2	247.2	248.5	248.5	248.5	248.5	100.0
Chicago, Rock Island & Pacific	653.3	283.1			936.4	1,219.5	997.7				997.7	997.7	1,934.1	2,217.2	6,674.1	6,953.3	31.9
Chicago, Rock Island & Gulf	32.6				32.6	32.6							32.6	32.6	466.0	466.0	7.0
St. Paul & Kansas City Short Line							112.5				112.5	112.5	112.5	112.5	117.7	117.7	95.6
Chicago, St. Paul, Minneapolis & Omaha	22.5	90.4			112.9	203.3	494.0	53.3			547.3	600.6	660.2	803.9	1,571.8	1,724.6	46.6
Chicago, Terre Haute & Southeastern	1.5				1.5	1.5							1.5	1.5	351.0	367.6	.4
Cincinnati, Hamilton & Dayton	19.2	17.1			36.3	53.4	352.7	29.5			382.2	411.7	418.5	465.1	527.9	579.5	80.3
Cincinnati, Indianapolis & Western							283.9				283.9	283.9	283.9	283.9	360.9	360.9	78.6
Colorado Midland							2.0				2.0	2.0	2.0	2.0	261.1	261.1	.8
Columbia & Puget Sound	10.0	8.9			18.9	27.8							18.9	27.8	50.8	61.2	45.4
Cornwall & Lebanon							8.3	13.7			22.0	35.7	22.0	35.7	22.0	35.7	100.0
Cumberland & Pennsylvania							4.3		3.0		7.3	13.3	7.3	13.3	31.3	37.3	36.2
Cumberland Valley	7.6	47.4			55.0	102.4	90.5				90.5	90.5	145.5	192.9	162.1	216.6	89.1
Delaware & Hudson	164.2	225.2	4.3	17.5	411.2	697.6		34.6			34.6	69.2	445.8	766.8	743.9	1,042.4	73.6
Delaware, Lackawanna & Western	224.3	449.1	50.5	10.6	734.5	1,316.3	4.3				4.3	4.3	738.8	1,320.6	985.0	1,584.4	46.6
Denver & Rio Grande							7.7				7.7	7.7	7.7	7.7	2,247.3	2,406.7	.3
Duluth & Iron Range		15.7			15.7	17.1							15.7	17.1	200 0	271.3	6.4
Durham & Southern							56.0				56.0	56.0	56.0	56.0	56.0	56.0	100.0
Elgin, Joliet & Eastern	2.0	3.0			5.0	8.0	11.0				11.0	11.0	16.0	19.0	211.2	270.1	4.1
Erie	4.5	234.9		14.8	254.2	533.5	500.9	545.7			1,046.6	1,592.3	1,300.8	2,125.8	1,704.4	2,529.4	84.4
Chicago & Erie							228.4	20.4			248.8	269.2	248.8	269.2	248.8	269.2	100.0
Columbus & Erie							12.6	9.8			22.4	32.2	22.4	32.2	22.4	32.2	100.0
Erie & Jersey		42.3			42.3	84.6							42.3	84.6	Freight Line.		
Genesee River							32.6				32.6	32.6	32.6	32.6	32.6	32.6	100.0
New Jersey & New York	12.5	10.5			23.0	33.5	13.6				13.6	13.6	36.6	47.1	51.9	62.4	75.5
New York, Susquehanna & Western and Wilkesbarre & Eastern							32.0	13.7			45.7	59.4	45.7	59.4	194.5	208.2	28.5
Grand Trunk	1.1	78.2			79.3	157.5	807.6	243.5			1,051.1	1,294.6	1,130.4	1,452.1	1,130.4	1,452.1	100.0
Great Northern	9.9	162.0			171.9	333.9	308.2				308.2	308.2	480.1	642.1	7,452.4	7,653.6	8.4
Hocking Valley							138.4				138.4	138.4	138.4	138.4	338.0	338.0	40.9
Hudson & Manhattan	3.0	7.9			10.9	18.8							10.9	18.8	10.9	18.8	100.0
Illinois Central	83.6	293.3		26.3	403.2	805.4	11.0				11.0	11.0	414.2	816.4	4,432.1	5,218.5	15.6
Yazoo & Mississippi Valley	6.6				6.6	6.6		7.9			7.9	14.3	14.5	20.9	1,193.0	1,200.7	1.7
Illinois Traction	82.3	1.5			83.8	85.3							83.8	85.3	443.1	452.6	18.8
Kanawha & Michigan	1.8				1.8	1.8	2.3				2.3	2.3	4.1	4.1	163.9	163.9	.3
Kentucky & Indiana Bridge & R. R. Co							3.0	8.2			11.2	19.4	11.2	19.4	11.2	19.4	100.0
Kentwood & Eastern							3.3				3.3	3.3	3.3	3.3	30.0	30.0	11.0
Lackawanna & Wyoming Valley							1.0	2.4			3.4	5.8	3.4	5.8	22.6	43.3	13.2
Lehigh & New England	.7				.7	.7							.7	.7	67.2	67.2	1.0
Lehigh Valley	14.1	446.3	34.8	24.0	519.2	1,107.1	648.4	58.8			707.2	766.0	1,226.4	1,873.1	1,215.3	1,862.0	100.0
Long Island	4.0	92.2	3.3	12.4	111.9	251.7	5.0	9.1			14.1	23.2	126.0	274.9	359.3	531.9	51.0
Louisville & Nashville	79.1	18.0			97.1	115.1	148.1	65.5			213.6	279.1	310.7	394.2	4,467.8	4,639.4	8.5
Maine Central	437.2	62.2			499.4	561.6							499.4	561.6	1,115.5	1,173.9	47.8
Portland Terminal	4.0	11.5			15.5	27.0							15.5	27.0	18.3	28.7	94.0
Minneapolis & St. Louis							11.3				11.3	11.3	11.3	11.3	1,537.4	1,547.3	.7
Minneapolis, St. Paul & Sault Ste. Marie							1,411.0	4.4			1,415.4	1,419.8	1,415.4	1,419.8	3,497.2	3,501.6	40.5

TABLE 1—CONTINUED.—RAILWAYS WORKED BY THE BLOCK SYSTEM.

Names of railroads.	Automatic block signals.						Nonautomatic block signals						Total automatic and nonautomatic.		Total passenger lines operated.		Percentage block signaled, miles of track.
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track	
Missouri, Kansas & Texas	9.1	1.4	.....	.....	10.5	11.9	9.5	.....	.....	.....	9.5	9.5	20.0	21.4	2,799.9	2,858.2	.7
Missouri Pacific	57.8	34.5	.....	.....	92.3	126.3	3,580.0	14.7	.....	.....	3,594.7	3,609.3	3,687.0	3,735.6	3,741.2	3,806.2	98.1
St. Louis, Iron Mountain & Southern	113.8	13.2	.....	.....	127.0	140 3	2,638.2	169.4	.....	.....	2,807.6	2,977.0	2,934.6	3,117.3	3,096.0	3,290.5	94.7
Mobile & Ohio	.....	4.7	.....	.....	4.7	9.4	51.9	.....	.....	.....	51.9	51.9	56.6	61.3	822.3	827.0	6.9
Monongahela	.5	.....	.....	.....	.5	.5	.....	.....	.....	.....	.....	.....	.5	5	66.7	66.7	.7
Munising, Marquette & Southeastern	.....	.....	.....	.....	.....	.....	3.7	.....	.....	.....	3.7	3.7	3.7	3.7	123.8	123.8	3.0
Nashville, Chattanooga & St. Louis	.....	.....	.....	.....	.....	.....	109.1	11.8	.....	.....	120.9	132.7	120.9	132.7	1,230.1	1,241.9	10.7
Newburgh & South Shore	.....	.....	.....	.....	.....	.....	.1	5.2	.....	.....	5.3	10.5	5.3	10.5	Freight Line.		.....
New York & Long Branch	.....	38.0	.....	.....	38.0	76.0	.....	.....	.....	.....	.....	.....	38.0	76.0	38.0	76.0	100.0
New York Central Lines:																	
Boston & Albany	.....	129.4	54.1	23.6	207.1	515.5	.....	1.4	.....	.....	1.4	2.8	208.5	518.3	356.8	669.1	77.5
Chicago, Indiana & Southern	.....	5.0	.....	.....	5.0	10.0	144.1	59.1	.....	.....	203.2	262.3	208.2	272.3	303.0	367 1	74.2
Cleveland, Cincinnati, Chicago & St. Louis	2.3	52.8	..	.....	55.1	107.9	542.6	326.2	.....	.....	868.8	1,195.0	923.9	1,302.9	1,865.4	2,283 2	57.1
Lake Erie & Western	9.8	9.0	.....	.....	18.8	27 8	853.0	.....	.....	.....	853.0	853.0	871.8	880.8	832 5	841.5	100 0
Lake Shore & Michigan Southern	27.8	184.0	106.9	250.2	568.9	1,717.3	1,024.2	64.0	.....	.....	1,088.2	1,152 2	1,657.1	2,869.5	1,597.2	2,767.1	99.8
Dunkirk, Allegheny Valley & Pittsburgh	.....	.....	.....	.....	.....	.....	90 5	.....	.....	.....	90.5	90.5	90.5	90.5	90.5	90.5	100.0
Lake Erie & Pittsburgh	.....	.....	.....	.....	.....	.....	27.8	.....	.....	.....	27.8	27.8	27.8	27.8	Freight Line.		.....
Michigan Central	.....	271.9	.....	.....	271.9	543.8	905.8	15 9	.....	.....	921.7	937.7	1,193.6	1,481.5	1,203.6	1,481.5	100.0
New York Central & Hudson River	1.9	555.9	8.2	111.8	677.8	1,595.2	1,590.1	747.4	15.4	.....	2,352.9	3,131.2	3,030.7	4,726.4	3,059.6	4,786.3	98.7
Peoria & Eastern	.....	.....	.....	.....	.....	.....	84.0	1.7	.....	.....	85.7	87.4	85.7	87.4	337.9	340.3	25.7
Pittsburgh & Lake Erie	.....	106.4	1.6	49.3	157.3	414.8	2.7	.....	.....	.....	2.7	2.7	160.0	417.5	166.2	426.8	97.8
New York, Chicago & St. Louis	15.4	.....	.....	.....	15.4	15.4	.....	.....	.....	.....	.....	.....	15.4	15.4	523.0	523.0	2.9
New York, New Haven & Hartford	1.6	300.5	.....	15.8	317.9	684.2	131.9	192.8	.....	73.7	398.4	812.3	716.3	1,496.5	2,187.5	3,120,4	47.9
New York, Ontario & Western	38.0	150.1	.....	.....	188.1	294.1	.....	.....	.....	.....	.....	.....	188.1	294.1	512.2	664.4	44.3
New York, Philadelphia & Norfolk	.....	8.8	..	.....	8.8	17.6	36.0	47.6	.....	.....	83.6	131.2	92.4	148.8	112.0	168.4	88.3
Cape Charles	.....	.....	.....	.....	.....	.....	9.4	.....	.....	.....	9.4	9.4	9.4	9.4	9.5	9.5	99.2
Norfolk & Western	101.0	415.9	..	.....	516.9	932.8	1,067.8	.....	.....	.....	1,067.8	1,067.8	1,584.7	2,000.6	1,699.4	2,115.3	93.2
Northern Pacific	101.5	377.1	.....	.....	478.6	855.7	675.7	122.7	.....	.....	798.4	921.3	1,277.0	1,777.0	5,424.0	6,017.6	23.5
Northwestern Pacific	13.4	12.7	.....	.....	26 1	38.8	.....	.....	.....	.....	.....	.....	26.1	38.8	383.2	395.9	9.8
Pennsylvania	.9	85.5	6.1	247.2	339.7	1,202.3	2,064.4	633.6	27.7	146.2	2,871.9	4,011.3	3,211.6	5,213.6	3,211 6	5,213.6	100 0
Grand Rapids & Indiana	.....	.....	.....	.....	.....	.....	138.9	2.2	.....	.....	141.1	143.3	141.1	143.3	532.5	545.1	26.3
Northern Central	.....	1.5	.....	.....	1.5	3.0	292.6	121.2	.....	18.8	432.6	610.2	434.1	613.2	434.1	613.2	100.0
Pennsylvania Co.	.....	453.5	21.5	52.7	527.7	1,182.3	576.5	185.9	.....	10.6	773.0	990.7	1,300.7	2,173.0	1,652 6	2,546.0	85.4
Philadelphia, Baltimore & Washington	.....	57.1	12.4	33.0	102.5	283.4	427.9	105.6	.....	8.2	541.7	671.9	644.2	955.3	644.2	955.3	100.0
Pittsburgh, Cincinnati, Chicago & St. Louis	.....	10.2	.....	3.5	13.7	34.4	478.3	529.1	59.8	34.9	1,102.1	1,855.5	1,115.8	1,889.9	1,415.6	2,190.9	86.3
West Jersey & Sea Shore	88.8	6.3	.....	.....	95.1	196.5	185.5	35.5	.....	.....	221.0	256.5	316.1	453.0	316.1	453.3	100.0
Vandalia	.....	.....	.....	.....	.....	.....	300.7	61.1	.....	.....	361.8	423.0	361.8	423.0	797.1	868.4	48.7
Peoria & Pekin Union	.....	.8	.....	.....	.8	1.6	.....	6.0	.....	.....	6.0	12.0	6.8	13.6	15.2	24.2	53.7
Pere Marquette	9.3	.....	.....	.....	9.3	9.3	26.6	.....	.....	.....	26.6	26.6	35.9	35.9	1,628.9	1,687.4	21.2
Philadelphia & Reading	16.4	326.5	33.3	29.5	405.7	887.3	133.1	87.0	.....	.....	220.1	307.1	625.8	1,194.4	870.0	1,470.0	81.3
Atlantic City	.....	86.8	.....	.....	86.8	173.6	35.9	.....	.....	.....	35.9	35.9	122.7	209.5	164.0	251.9	83.2
Gettysburg & Harrisburg	.....	.....	.....	.....	.....	.....	24.2	.....	.....	.....	24.2	24.2	24.2	24.2	31.0	31.0	78.1
Northeast Pennsylvania	2.8	2.0	.....	.....	4.8	6.8	1.6	.....	.....	.....	1.6	1.6	6.4	8.4	25.6	27.6	30.4
Perkiomen	.....	.....	.....	.....	.....	.....	38.2	.....	.....	.....	38.2	38.2	38.2	38.2	38.2	38.2	100.0
Philadelphia, Newton & New York	3.8	1.7	1.6	.....	7.1	12.0	.....	.....	.....	.....	.....	.....	7.1	12.0	21.7	26.6	45.1
Reading & Columbia	.....	.....	.....	.....	.....	.....	34.9	.....	.....	.....	34.9	34.9	34.9	34.9	53.3	53.3	65.4
Quincy, Omaha & Kansas City and Iowa & St. Louis	.....	.....	.....	.....	.....	.....	307.8	.....	.....	.....	307.8	307.8	307.8	307.8	307.8	307.8	100.0
Queen & Crescent Route:																	
Alabama & Vicksburg	16.0	.....	.....	.....	16.0	16.0	.....	.....	.....	.....	.....	.....	16.0	16.0	139.3	139.3	11.5
Alabama Great Southern	108.1	.4	.....	.....	108.5	108.9	74.1	.....	.....	.....	74.1	74.1	182.6	183.0	290.5	297.7	61.4
Cincinnati, New Orleans & Texas Pacific	252.1	82.6	.....	.....	334.7	417.3	.7	.....	.....	.....	.7	.7	335.4	418.0	335.4	418.0	100.0
New Orleans & Northeastern	93.0	15.5	.....	.....	108.5	124.0	.....	.....	.....	.....	.....	.....	108.5	124.0	195.6	211.1	58.7
Richmond, Fredericksburg & Potomac	.....	.....	.....	.....	.....	.....	9.0	78.7	.....	.....	87.7	166.4	87.7	166.4	87.7	166.4	100.0
St. Joseph & Grand Island	.....	.....	.....	.....	.....	.....	.3	.....	.....	.....	.3	.3	.3	.3	251.6	251.6	.1
St. Louis & San Francisco	726.5	34.1	.....	.....	760.6	794.7	108.3	.....	.....	.....	108.3	108.3	868.9	903.0	5,255.0	5,335.8	16.9
Beaumont, Sour Lake & Western	.....	.....	.....	.....	.....	.....	84.3	.....	.....	.....	84.3	84.3	84.3	84.3	118.3	118.3	71.3
New Orleans, Texas & Mexico	.....	.....	.....	.....	.....	.....	157.6	.....	.....	.....	157.6	157.6	157.6	157.6	275.5	275.5	56.1
Orange & Northwestern	.....	.....	.....	.....	.....	.....	61.6	.....	.....	.....	61.6	61.6	61.6	61.6	61.6	61.6	100.0
St. Louis, Brownsville & Mexico	.....	.....	.....	.....	.....	.....	451.1	.....	.....	.....	451.1	451.1	451.1	451.1	497.0	497.0	90.8
St. Louis Merchants' Bridge Terminal	.....	5.9	.....	.....	5.9	11.8	.....	1.1	.....	.....	1.1	2.2	7.0	14.0	9.9	19.8	7.7
St. Louis Southwestern	.4	.....	.....	.....	.4	.4	.....	.....	.....	.....	.....	.....	.4	.4	650.2	652,6	.....
San Francisco, Oakland & San Jose Consolidated	.....	3.9	.....	.....	3.9	7.8	.....	.....	.....	.....	.....	.....	3.9	7.8	21.8	36.0	21.4
San Pedro, Los Angeles & Salt Lake	3.7	.....	.....	.....	3.7	3.7	.....	.....	.....	.....	.....	.....	3.7	3.7	1,134.6	1,134.6	.3
Seaboard Air Line	.....	.....	.....	.....	.....	.....	211.1	.....	.....	.....	211.1	211.1	211.1	211.1	2,820.3	2,820.3	7.4
Southern	.....	14.7	.....	.....	14.7	29.4	1,562.3	331.5	.....	.....	1,893.8	2,225.3	1,908.5	2,254.7	6,636.3	7,007.8	32.2
Virginia & Southwestern	.....	.....	.....	.....	.....	.....	2.2	.....	.....	.....	2.2	2.2	2.2	2.2	225.4	225.4	1.0
Southern Illinois & Missouri Bridge	.....	4.6	.....	.....	4.6	9.2	.....	.....	.....	.....	.....	.....	4.6	9.2	4.6	9.2	100.0
Southern Pacific, Atlantic system:																	
Galveston, Harrisburg & San Antonio	279.1	.....	.....	.....	279.1	279.1	.....	.....	.....	.....	.....	.....	279.1	279.1	1,270.3	1,274.8	21.9
Louisiana Western	103.6	.....	.....	.....	103.6	103.6	.....	.....	.....	.....	.....	.....	103.6	103.6	140.5	140.5	73.8
Morgan's Louisiana & Texas	95.3	.....	.....	.....	95.3	95.3	.....	.....	.....	.....	.....	.....	95.3	95.3	292.9	332.1	28.6
Texas & New Orleans	109.8	.....	.....	.....	109.8	109.8	.....	.....	.....	.....	.....	.....	109.8	109.8	438.4	441.8	24.9
Southern Pacific, Pacific system	2,227.3	254.7	3.1	3.5	2,488.6	2,737.3	37.3	28.7	.....	.....	66.0	94.7	2,554.6	2,832.0	6,615.8	6,958.4	41.2
Spokane & Inland Empire	.3	.....	.....	.....	.3	.3	.....	.....	.....	.....	.....	.....	.3	.3	168.3	187.3	.1
Spokane, Portland & Seattle	.5	6.8	.....	.....	7.3	14.1	.....	.....	.....	.....	.....	.....	7.3	14.1	505.6	515.6	2.7
Staten Island Rapid Transit	.....	10.3	.....	.6	10.9	23.0	.....	.....	.....	.....	.....	.....	10.9	23.0	10.9	23.0	100.0
Staten Island	.....	10.2	.....	.....	10.2	20.4	2.5	.....	.....	.....	2.5	2.5	12.7	22.9	12.7	22.9	100.0
Syracuse, Lake Shore & Northern	17.3	6.5	.....	.....	23.8	30.3	.....	.....	.....	.....	.....	.....	23.8	30.3	37.1	56.1	54.0
Terminal R. R. Assn. of St. Louis	6.0	.....	.....	.....	6.0	12.0	.....	1.1	.....	.....	1.1	2.2	7.1	14.2	12.7	25.4	56.0
Texas & Pacific	1.0	.....	.....	.....	1.0	1.0	.....	.....	.....	.....	.....	.....	1.0	1.0	1,885.0	1,885.0	.....
Tidewater Power Co	.....	.....	.....	.....	.....	.....	6.2	.....	.....	.....	6.2	6.2	6.2	6.2	11.3	15.7	39.5
Toledo, Peoria & Western	.....	.....	.....	.....	.....	.....	.3	.....	.....	.....	3	.3	.3	.3	220.0	220.0	.1
Toledo, St. Louis & Western	.....	.....	.....	.....	.....	.....	188.1	.....	.....	.....	188.1	188.1	188.1	188.1	451.0	451.0	41.7
Ulster & Delaware	24.4	.....	.....	.....	24.4	24.4	.....	.....	.....	.....	.....	.....	24.4	24.4	126.3	126.3	19.8
Union	.....	.6	.....	.....	.6	1.2	1.4	.....	.....	.....	1.4	1.4	2.0	2.6	7.4	14.8	17.5
Union Pacific	740.3	727.7	.....	1.7	1,469.7	2,198.5	10.9	.....	.....	.....	10.9	10.9	1,480.6	2,209.4	3,541.3	4,312.2	51.2
Oregon-Washington R. R. & Navigation Co	416.8	19.2	.....	.....	436.0	455.2	1.3	.....	.....	.....	1.3	1.3	437.3	456.5	1,070.7	1,094.1	42.5
Oregon Short Line	518.7	57.2	.....	.....	575.9	633 1	.....	.....	.....	.....	.....	.....	575.9	633.1	1,545.4	1,604.6	39.4
Virginia & Kentucky	.....	.....	.....	.....	.....	.....	.6	.....	.....	.....	.6	.6	.6	.6	4.8	4.8	12.5
Virginian	.....	.....	.....	.....	.....	.....	17.6	.....	.....	.....	17.6	17.6	17.6	17.6	460.0	460.0	3.8
Wabash	39.2	19.7	.....	.....	58.9	78.6	1,648.9	200.9	.....	.....	1,849.8	2,050.7	1,908.7	2,129.3	1,987.9	2,188.8	97.2
Wabash Pittsburgh Terminal	.....	4.1	.....	.....	4.1	8.2	.....	.....	.....	.....	.....	.....	4.1	8.2	63.3	67.4	12.2
Washington Southern	.....	4.1	.....	1.5	5.6	14.2	.....	26.6	.....	.....	26.6	53.2	32.2	67.4	32.2	67.4	100.0
Washington, Baltimore & Annapolis	13.8	.....	.....	.....	13.8	13.8	.....	.....	.....	.....	.....	.....	13.8	13.8	52.2	84.4	16.3
Washington Terminal	.....	1.1	.....	1.0	2.1	20.4	.....	.....	.....	.....	.....	.....	2.1	20.4	2.1	20.4	100.0
Washington Water Power Co	22.5	.....	.....	.....	22.5	22.5	.....	.....	.....	.....	.....	.....	22.5	22.5	22.5	22.5	100.0
Western Pacific	11.2	.....	.....	.....	11.2	11.2	.....	.....	.....	.....	.....	.....	11.2	11.2	11.2	11.2	100.0
Total	10,128.1	10,728.7	368.0	994.0	22,218.8	36,934.3	52,833.6	8,366.9	230.6	299.9	61,731.0	71,468.7	83,949.8	108,403.0	183,460.8	209,902.2	.....

TABLE 2—KINDS OF AUTOMATIC BLOCK SIGNALS IN USE.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.						Normal clear.	Normal danger.	Total automatic signals.		
					Electro-pneumatic.		Electric motor.		Electro-gas.						
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of track.	Miles of track.	Miles of road.	Miles of track.	Number of block stations.
Albany Southern							0.5	0.5			0.5		0.5	0.5	2
Arizona & New Mexico							1.0	1.0			1.0		1.0	1.0	1
Atchison, Topeka & Santa Fe:															
Eastern lines							135.9	249.6			249.6		135.9	249.6	179
Western lines							2.5	5.0			5.0		2.5	5.0	7
Coast lines							127.5	180.1			180.1		127.5	180.1	149
Gulf, Colorado & Santa Fe			3.6	3.6							3.6		3.6	3.6	6
Atlantic Coast Line							53.5	104.6			104.6		53.5	104.6	111
Auburn & Northern							6.5	6.5			6.5		6.5	6.5	3
Baltimore & Ohio					14.2	46.8	195.2	401.3	93.6	187.3	53.4	582.0	303.0	635.4	727
Baltimore & Ohio Chicago Terminal			1.0	2.0			14.5	27.2			29.2		15.5	29.2	51
Baltimore & Ohio Southwestern							24.9	49.7				49.7	24.9	49.7	75
Boston & Maine			.8	1.6			1,017.7	1,629.2	8.9	17.8	1,629.2	19.4	1,027.4	1,648.6	2,120
Boston, Revere Beach & Lynn							13.8	27.6			27.6		13.8	27.6	59
Buffalo, Rochester & Pittsburgh							35.1	70.2			70.2		35.1	70.2	66
Butte, Anaconda & Pacific			7.9	7.9							7.9		7.9	7.9	8
Central New England							31.4	49.0			49.0		31.4	49.0	55
Central of New Jersey					29.7	116.0	163.3	323.2	19.4	38.0	439.2	38.0	212.4	477.2	736
Chesapeake & Ohio							454.6	909.2			909.2		454.6	909.2	631
Chicago & Alton							605.3	789.9			367.6	422.3	605.3	789.9	418
Chicago & Eastern Illinois			8.7	13.8			106.2	212.4			226.2		114.9	226.2	177
Chicago & North Western			659.6	1,490.5			163.5	297.7			1,788.2		823.1	1,788.2	1,497
Chicago & Western Indiana					1.7	3.4	17.8	35.6			39.0		19.5	39.0	63
Chicago, Burlington & Quincy			23.0	46.0			74.8	120.0			166.0		97.8	166.0	135
Chicago Great Western							283.1	369.3			369.3		283.1	369.3	273
Chicago, Indianapolis & Louisville							161.9	161.9			161.9		161.9	161.9	106
Chicago, Milwaukee & St. Paul			2.4	2.4			103.7	207.4			207.4	2.4	106.1	209.8	252
Chicago, Milwaukee & Puget Sound							363.1	363.1			363.1		363.1	363.1	253
Chicago, Peoria & St. Louis Ry. of Illinois							1.3	1.3			1.3		1.3	1.3	1
Chicago, Rock Island & Pacific			6.0	12.0			930.4	1,207.5			1,217.1	2.4	936.4	1,219.5	1,294
Chicago, Rock Island & Gulf							32.6	32.6			32.6		32.6	32.6	50
Chicago, St. Paul, Minneapolis & Omaha							112.9	203.3			203.3		112.9	203.3	147
Chicago, Terre Haute & Southeastern							1.5	1.5			1.5		1.5	1.5	1
Cincinnati, Hamilton & Dayton							36.3	53.4			53.4		36.3	53.4	59
Columbia & Puget Sound							18.9	27.8			27.8		18.9	27.8	25
Cumberland Valley							55.0	102.4			102.4		55.0	102.4	114
Delaware & Hudson			29.6	59.2			19.8	38.0	361.8	600.4		697.6	411.2	697.6	1,054
Delaware, Lackawanna & Western			27.5	55.0	2.0	8.0	705.0	1,253.3			1,316.3		734.5	1,316.3	1,843
Duluth & Iron Range							15.7	17.1			17.1		15.7	17.1	7
Elgin, Joliet & Eastern							5.0	8.0			8.0		5.0	8.0	5
Erie							254.2	533.5			339.9	193.6	254.2	533.5	630
Erie & Jersey							42.3	84.6			84.6		42.3	84.6	88
New Jersey & New York							23.0	33.5			12.5	21.0	23.0	33.5	52
Grand Trunk					1.1	1.1	78.2	156.4			157.5		79.3	157.5	99
Great Northern							171.9	333.9			331.7	2.2	171.9	333.9	291
Illinois Central			28.0	106.0			200.3	355.8	174.9	343.6	424.4	381.0	403.2	805.4	836
Yazoo & Mississippi Valley							6.6	6.6			6.6		6.6	6.6	8
Illinois Traction							83.8	85.3			85.3		83.8	85.3	60
Kanawha & Michigan			1.0	1.0			.8	.8			1.8		1.8	1.8	2
Lehigh & New England							.7	.7			.7		.7	.7	1
Lehigh Valley			145.0	347.3			358.8	729.9	15.4	30.8		1,107.1	519.2	1,107.1	1,110
Long Island							111.9	251.7			251.7		111.9	251.7	400
Louisville & Nashville							97.1	115.1			115.1		97.1	115.1	213
Maine Central							499.4	561.6			561.6		499.4	561.6	588
Portland Terminal							15.5	27.0			27.0		15.5	27.0	37
Missouri, Kansas & Texas			.5	.5			10.0	11.4			11.9		10.5	11.9	17
Missouri Pacific							92.3	126.3			126.3		92.3	126.3	113
St. Louis, Iron Mountain & Southern							127.0	140.3			140.3		127.0	140.3	140
Mobile & Ohio							4.7	9.4			9.4		4.7	9.4	6
Monongahela							.5	.5			.5		.5	.5	1
New York & Long Branch							38.0	76.0			76.0		38.0	76.0	118
New York Central Lines:															
Boston & Albany	7.9	15.8					197.8	495.4			134.5	376.7	205.7	511.2	641
Chicago, Indiana & Southern							5.0	10.0			10.0		5.0	10.0	14
Cleveland, Cincinnati, Chicago & St. Louis							55.1	107.9			107.9		55.1	107.9	104
Lake Erie & Western							18.8	27.8			27.8		18.8	27.8	30
Lake Shore & Michigan Southern			5.3	5.3			393.8	1,065.5	169.8	646.5	1,070.8	646.5	568.9	1,717.3	1,769
Michigan Central			3.6	7.2			251.8	503.6			510.8		255.4	510.8	386
New York Central & Hudson River			5.0	10.0			662.9	1,561.6	8.0	16.0	345.2	1,242.4	675.9	1,587.6	1,946
Pittsburgh & Lake Erie							157.3	414.8			414.8		157.3	414.8	573
New York, Chicago & St. Louis							15.4	15.4			15.4		15.4	15.4	17
New York, New Haven & Hartford	154.7	309.4	62.4	124.8			100.8	250.0			684.2		317.9	684.2	770
New York, Ontario & Western			93.5	123.8			94.6	170.3			294.1		188.1	294.1	182
New York, Philadelphia & Norfolk							8.8	17.6			17.6		8.8	17.6	9
Norfolk & Western					.7	.7	516.2	932.1			932.1	.7	516.9	932.8	953
Northern Pacific			1.5	1.5			476.6	853.2	.5	1.0	855.7		478.6	855.7	713
Northwestern Pacific							26.1	38.8			38.8		26.1	38.8	70
Pennsylvania			4.6	9.2	254.5	962.5	74.6	211.7			1,183.4		333.7	1,183.4	1,990
Northern Central					1.5	3.0					3.0		1.5	3.0	4
Pennsylvania Co.							527.7	1,182.3			1,182.3		527.7	1,182.3	1,512
Philadelphia, Baltimore & Washington					37.3	116.6	65.2	166.8			283.4		102.5	283.4	353
Pittsburgh, Cincinnati, Chicago & St. Louis							13.7	34.4			34.4		13.7	34.4	84
West Jersey & Sea Shore					77.3	160.9	17.8	35.6			196.5		95.1	196.5	258
Peoria & Pekin Union			.8	1.6								1.6	.8	1.6	3
Pere Marquette			.9	.9			8.4	8.4			9.3		9.3	9.3	9
Philadelphia & Reading			404.5	880.6	3.8	4.8	2.6	6.1	13.3	19.7	1.6	909.6	421.5	911.2	1,048
Atlantic City			86.8	173.6								173.6	86.8	173.6	96
Northeast Pennsylvania			4.8	6.8								6.8	4.8	6.8	8
Philadelphia, Newton & New York			7.1	12.0								12.0	7.1	12.0	17
Queen & Crescent Route:															
Alabama & Vicksburg							16.0	16.0			16.0		16.0	16.0	18
Alabama Great Southern	32.0	32.0	9.0	9.0			67.5	67.9			108.9		108.5	108.9	78
Cincinnati, New Orleans & Texas Pacific	32.5	32.5	39.2	39.2			257.7	337.0	5.3	8.6	385.9	31.4	334.7	417.3	348
New Orleans & Northeastern							108.5	124.0			124.0		108.5	124.0	103
St. Louis & San Francisco							760.6	794.7			794.7		760.6	794.7	1,354
St. Louis Merchants' Bridge Terminal							5.9	11.8			11.8		5.9	11.8	30
St. Louis Southwestern							.4	.4			.4		.4	.4	1
San Francisco, Oakland & San Jose Consolidated							3.9	7.8			7.8		3.9	7.8	76
San Pedro, Los Angeles & Salt Lake							3.7	3.7			3.7		3.7	3.7	3
Southern							14.7	29.4			29.4		14.7	29.4	31
Southern Illinois & Missouri Bridge							4.6	9.2			9.2		4.6	9.2	18
Southern Pacific-Atlantic System:															
Galveston, Harrisburg & San Antonio							279.1	279.1			279.1		279.1	279.1	204
Louisiana Western							103.6	103.6			103.6		103.6	103.6	73
Morgan's Louisiana & Texas							95.3	95.3			95.3		95.3	95.3	72
Texas & New Orleans							109.8	109.8			109.8		109.8	109.8	77
Southern Pacific-Pacific System					3.1	14.2	2,485.5	2,723.1			2,737.3		2,488.6	2,737.3	2,403

TABLE 2—CONTINUED.

Names of railroads.	Exposed disk.		Inclosed disk.		Semaphores.						Normal clear.	Normal danger.	Total automatic signals.		
					Electro-pneumatic.		Electric motor.		Electro-gas.						
	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	Miles of track.	Miles of track.	Miles of road.	Miles of track.	Number of block stations.
Spokane and Inland Empire							.3	.3				.3	.3	.3	2
Spokane, Portland & Seattle							7.3	14.1			14.1		7.3	14.1	11
Staten Island Rapid Transit			10.9	23.0							23.0		10.9	23.0	55
Staten Island			10.2	20.4							20.4		10.2	20.4	32
Syracuse, Lake Shore & Northern							23.8	30.3			30.3		23.8	30.3	31
Terminal R. R. Ass'n of St. Louis							6.0	12.0			12.0		6.0	12.0	16
Texas & Pacific							1.0	1.0			1.0		1.0	1.0	1
Ulster & Delaware							24.4	24.4			24.4		24.4	24.4	20
Union			.6	1.2							1.2		.6	1.2	2
Union Pacific			8.7	15.0			1,430.1	2,121.7	30.9	61.8	2,198.5		1,469.7	2,198.5	1,755
Oregon-Washington R. R. & Navigation Co							436.0	455.2			455.2		436.0	455.2	347
Oregon Short Line			1.3	1.3			574.6	631.8			633.1		575.9	633.1	501
Wabash							58.9	78.6			78.6		58.9	78.6	110
Wabash Pittsburgh Terminal							4.1	8.2			8.2		4.1	8.2	11
Washington, Baltimore & Annapolis							13.8	13.8			13.8		13.8	13.8	8
Washington Southern					5.6	14.2					14.2		5.6	14.2	12
Washington Terminal					2.1	20.4						20.4	2.1	20.4	13
Washington Water Power Co							22.5	22.5			22.5		22.5	22.5	29
Western Pacific							11.2	11.2			11.2		11.2	11.2	8
Total	227.1	389.7	1,705.3	3,615.2	434.6	1,472.6	18,930.5	29,424.0	901.8	1,971.5	29,932.3	6,940.7	22,196.6	36,873.0	38,982

printed December 27, page 1267, shows remarkable differences, the total length of road signaled, as shown in the table now published, being 6,000 miles greater than that in the earlier one; and yet, with the exception of a very few roads, for which we could not get accurate figures, all of the statistics in both tables are official. It will have to be assumed that a large mileage was put under the block system after December 15, when our information was gathered, and before January 15, when the reports were sent to the commission; or else that many inaccurate reports were made in one case or the other. That there has been some inaccuracy is indicated by the fact that the government statement shows for some roads a less mileage than was shown in ours.

We reprint the government statement because it contains more details than ours, and also because the government requires a good deal of collateral information, which should tend to make the whole more accurate.

The statement of the Missouri Pacific alone would account for 4,445 miles of the difference in the total mileage; but in addition to this there are large discrepancies in the statements of the Central Vermont, the Chicago, Peoria & St. Louis, the Cincinnati, Hamilton & Dayton and the St. Louis & San Francisco. Other roads on which the total now reported is considerably larger than appeared in our December report are: Atchison, Topeka & Santa Fe; Buffalo, Rochester & Pittsburgh; Chesapeake & Ohio; Chicago & Alton; Chicago, Rock Island & Pacific (St. Paul & Kansas City Short Line); Cumberland Valley; Delaware & Hudson; Louisville & Nashville; New York Central and the Wabash. The statements of the following roads show a smaller total than was shown in December: Baltimore & Ohio; Chicago & Eastern Illinois; Chicago & North Western; Chicago, Indianapolis & Louisville; Chicago, Milwaukee & St. Paul (Tacoma & Eastern 173 miles added); Copper Range; El Paso & Southwestern; Monongahela; New York, New Haven & Hartford; Pennsylvania Railroad; Queen & Crescent (Alabama Great Southern). The Minneapolis, St. Paul & Sault Ste. Marie, reporting this year 1,420 miles operated under the manual block system, reported on January 1, 1912, about 1,000 miles more than that.

The comparison of January 1, 1913, with January 1, 1912, shows a net increase of 7,540.1 miles of road block signaled, as follows:

	Jan. 1, 1913.	Jan. 1, 1912.	Increase.
Automatic, miles of road	22,218.8	20,334.9	1,883.9
Manual	61,731.0	56,074.8	5,656.2
Total miles	83,949.8	76,409.7	7,540.1

The last preceding report showed a total increase in twelve months of 5,140.6 miles.

The bulletin contains a separate list of the increases on certain roads. In this list are the names of thirteen companies on whose lines there has been a decrease in the mileage of roads worked by the manual block system. Most of these items, but not all, show that automatic signals have been installed in place of the manual.

A table is given showing the length of road on which alternating current is used in signal operating circuits and in track circuits. A mileage considerably in excess of that reported one year ago is shown on four roads: Atchison, Topeka & Santa Fe; Cumberland Valley; Pennsylvania, and Southern Pacific. On the Pennsylvania lines east of Pittsburgh there is now a length of over two hundred miles of road (589 miles of track) on which alternating current is used for track circuits.

The list of roads, showing the mileage on each, where upper-quadrant, three-position automatic block signals are used, is considerably longer than last year. The mileage of road equipped with upper-quadrant signals has increased materially on the following 14 roads: Atchison, Topeka & Santa Fe; Buffalo, Rochester & Pittsburgh; Chicago & North Western; Chicago, Rock Island & Pacific; Chicago, St. Paul, Minneapolis & Omaha; Columbia & Puget Sound; Cumberland Valley; Delaware & Hudson; Erie; Boston & Albany; New York Central; Norfolk & Western; Pennsylvania; Michigan Central. The table showing this data seems to be imperfect, as two prominent roads which appeared a year ago as using upper-quadrant signals are now absent from the list.

The list of roads from which statements were received concerning new work proposed for the present year differs considerably from that which we published December 27. The following roads, with the mileage given, did not appear in our list: Atchison, Topeka & Santa Fe, 300; Central New England, 17; Central of New Jersey, 28; Missouri, Kansas & Texas, 105; Southern, 96; Wabash, 244. The Pennsylvania, including lines west of Pittsburgh, reports over 1,000 miles proposed new work; but from statements made in the announcement which was published in the *Railway Age Gazette*, it is to be assumed that a large part of this mileage consists, not of extensions of the block system, but of lines on which the automatic system is to be introduced in place of the manual.

The tables in the bulletin are accompanied by numerous foot notes containing explanatory matter. Most of these notes convey the same information that has been given in former years, and need not be repeated in this place. Light signals—signals which give their indications by lights of different colors and in which the engineman sees no moving part—are now in use on the Boston & Maine (in Hoosac tunnel); the Hudson & Manhattan; the Buffalo, Rochester & Pittsburgh (2 miles); the New York Central and the Pennsylvania.

A comparison of the totals shown in Table No. 2 with those

in the same table published one year ago, shows that the length of road equipped with exposed disk signals has decreased sixteen miles; that equipped with enclosed disks, 172 miles. Electro-pneumatic block signalling has been increased by 10 miles (70 miles of track). The increase in mileage of electric motor signals is 2,082 (3,732 miles of track). The total increase in length of *tracks* equipped with automatic block signals is 3,530 miles, of which all but 34 miles is classed "normal clear." The last column in Table No. 2 should be headed "number of block sections," not block stations.

Table No. 3, not reproduced, shows that in the operation of the manual block system, the use of the telephone has been largely increased, as follows:

	1913. Miles of road.	1912. Miles of road.	
Telegraph	38,106	37,417	Inc. 689 miles
Telephone	23,002	16,544	Inc. 6,458 miles

There is an increase of 303 miles in the length of road where electric bells are used in manual block signalling, the Great Northern reporting 293 miles thus worked. The Great Northern also reports 212 miles of line worked by the controlled manual system, with no track circuits. On the New York Central the length of road worked by the controlled manual system has decreased 115 miles.

The electric train staff is now used on 508 miles of track, to which may be added five miles of the double track line in the Hoosac tunnel where the train staff is used whenever it is necessary to run trains on either track in a direction opposite to the current of traffic.

Table No. 4, not reproduced, shows 18,069 miles of road on which the manual block system is used only for the protection of trains at the rear; that is to say, in the blocking operations on single track, an operator sending a train eastward from A to B does not go through the formality of asking B to protect the section from westbound trains. The principal items making up this 18,069 miles are: Baltimore & Ohio, 1,708 miles; B. R. & P., 312; Central Vermont, 402; C. & N. W., 187; C. B. & Q., 6,315; Missouri Pacific, 7,213; Michigan Central, 922; Wabash, 835.

The table giving statistics of the use of the telegraph and the telephone in the transmission of train orders shows a total of 155,690 miles of road on which the telegraph is used, a decrease of 13,710 miles from the total of the preceding year; and that the telephone is used on 68,097 miles of road, an increase of 9,513 miles over the total of the preceding year.

SLIDE VALVE SUCCESSFULLY USED ON SUPERHEATER LOCOMOTIVES.

In 1911 the Delaware, Lackawanna & Western received 15 large consolidation locomotives from the American Locomotive Company. These were fitted with slide valves and were designed for a working steam pressure of 170 lbs. per sq. in., and a tractive effort of 51,400 lbs., thus necessitating the use of comparatively large cylinders, 26 in. x 30 in.; in spite of the fact that these and very carefully lagged to prevent heat losses the amount of condensation was considerable. To overcome such losses and effect a greater economy in operation it was decided to apply a superheater to one of the locomotives as an experiment. As the locomotives were less than two years old and the cylinders were in first class condition it seemed advisable to retain them and to try to use the slide valves, although experiments which had been made on other roads indicated that such valves could not be successfully used with superheat.

Engine 388 was selected for the test, and when the superheater was applied was equipped with gun iron valves, packing strips and balance plates. The pistons were also fitted with gun iron packing rings and the cylinders were bushed with the same material. Graphite lubricators, furnished by the National Graphite Lubricator Company, Scranton, Pa., were applied. Graphite in the stick form is used with this device and is pulverized and delivered directly to the cylinders through the oil plugs in combination with the usual hydrostatic lubrication from the cab lubricator. The graphite-oil mixture is introduced to the valve chamber over the balance plate, where it is intimately mixed with the inflowing steam and an auxiliary oil stream is applied to the bridges to direct sprays of oil against the under sides of the valve. None of the parts were redesigned. The saturated steam engines of this class have 445 tubes, while the superheated steam locomotive has 259 2 in. tubes and thirty-four 5⅜ in. flues. A working steam pressure of 160 lbs. is used as compared to 170 lbs. for the saturated steam locomotive. The grate area is 58 sq. ft.

The engine thus equipped was turned out of the Scranton, Pa., shops on December 13, 1912, and after being broken in was placed in service on December 16. Up to and including May 1, 1913, the following mileage has been made:

December	957	April	2,596
January	2,647	May 1	119
February	2,499		
March	2,739	Total	11,557

The locomotive has thus been in practically continuous service since the superheater was installed, and has been tried out exhaustively in slow and manifest freight service, taking its place in the pool with other engines of the same class. The degree of superheat is high, the terminal temperature ranging around 650 deg. F., as determined by the pyrometer readings. No more trouble has been experienced with the slide valve than on other engines of the same class using saturated steam.

Comparative tests of this engine made in slow freight service on the Scranton and the Morris & Essex division, as against a saturated steam engine of exactly the same design, gave the following results:

	Locomotive 388. Superheat.	Locomotive 399. Saturated Steam.
Engine miles	775	775
Ton miles	1,454,854	1,467,260
Time on road	72 hrs. 46 min.	73 hrs. 0 min.
Average speed, miles per hr.	10.63	10.6
Weight of coal used, lbs.	130,770	182,200
Coal per hour, lbs.	1,736	2,495
Coal per minute, lbs.	30	41.6
Coal per engine mile	168.3	234.7
Coal per 1,000 ton miles	89.9	124.2
Average coal per trip, lbs.	22.950	30,300

The superheated steam locomotive used 27.5 per cent. less coal per 1,000 ton miles and 28.3 per cent. less coal per engine mile. It should be noted that in addition to being equipped with the superheater it also had a brick arch, engine 399 having neither of these devices. The steam chests of the superheater engine have been removed and the valves and valve seats examined at regular intervals, but have been found at all times to be in first class condition. If the use of the graphite lubricator will make it possible to apply superheaters to old locomotives and retain the slide valves, thus cutting out the expense of providing new cylinders, the problem of converting such engines from saturated to superheated steam will be greatly simplified.

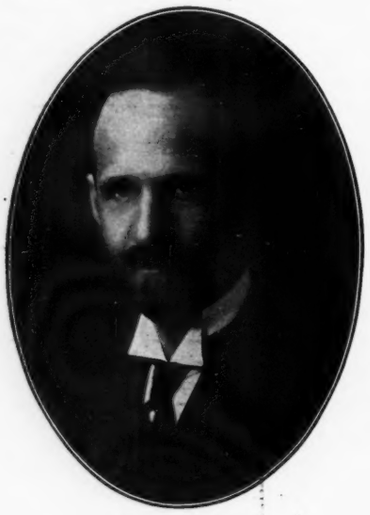
GERMAN RAILROAD CONSTRUCTION IN AFRICA.—The Germans are to extend the Usambara railroad, now at New Moschi, 196 miles inland from Tanga and at the foot of Mt. Kilimanjaro, to Mambo, German East Africa, and it will supposedly terminate finally at Lake Victoria. They are also building a railroad from Duala, on the Kamerun coast, to Bidjoka, 95 miles. This line is already open to a point on Sanga river 50 miles west of Edea. On the west coast the Germans, almost as soon as they received a portion of the French Congo as a result of the Morocco incident, considered the advisability of continuing this line to either Libenge on the Ubanghi river, at the mouth of the Lobaje, or to the Congo, at the mouth of the Sanga. It is reported that they are to build either a railroad or an automobile route betwen Bukoba, on Lake Victoria, and Kissenge, on Lake Kivu, which lies between German East Africa and Belgian Congo.—*Mining and Scientific Press.*

GOVERNMENT APPRAISAL ENGINEERS.

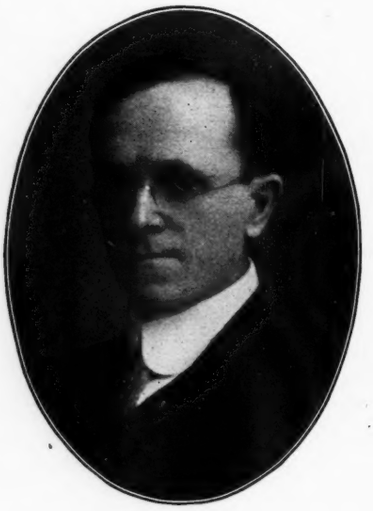
The announcement issued by the Interstate Commerce Commission giving the names of the engineers who have been engaged to make valuations of railway property in accordance with the law which went into effect on May 1, was noticed in the *Railway Age Gazette* of May 2, page 986. The country is to be divided into five districts, and each of these five engineers—R. A. Thompson, W. D. Pence, J. S. Worley, H. M. Jones and E. F. Wendt—will have direct charge of one district; and in addition each will be a member of a board to advise with the members of the Interstate Commerce Commission and with the advisory board of three engineers, which is yet to be appointed.

R. A. Thompson.

Robert Andrew Thompson, Mem. Am. Soc. C. E., was born July 11, 1869, at New Waverly, Tex., and was educated at the University of Texas, where he took his degree in 1892. He received the degree of master of arts in 1893 and of civil engineer in 1900. He was for a time instructor in civil engineering at the university. In 1895-7 he was engaged on construction work on the Kansas City Southern and other railways. For the eleven years, 1898-1908, Mr. Thompson was chief engineer of the State Railroad Commission of Texas. In January, 1909, he was appointed chief engineer of the Wichita Falls & Northwestern, in which position he remained nearly three years. While engaged in this work, he located and constructed about three hundred miles of railway in western Texas and Oklahoma, lines which are now a part of the Missouri, Kansas & Texas. Since October, 1911, Mr. Thompson has been chief engineer of the State Railroad Commission of California, where he has had charge of extensive valuation work.



W. D. Pence.



E. F. Wendt.

John S. Worley.

Edwin Frederick Wendt, Mem. Am. Soc. C. E., was born at New Brighton, Pa., and was educated at Geneva College, Beaver Falls, Pa., where he graduated with honors in 1888. In the same year he entered the service of the Pittsburgh & Lake Erie, joining the engineering corps, and he has been with that road ever since. He served continuously in the engineering department, holding different positions, until October 1, 1898, when he was appointed assistant engineer in charge of maintenance of way and construction and contract work. While he has held this position, the road has been greatly extended and in many parts reconstructed. Nearly all important structures have been rebuilt and a number of branch lines have been constructed. Mr. Wendt has for several years been on important committees of the American Railway Engineering Association and was chairman of the committee on records and accounts. In connection with this work and working in conjunction with the late Walter Berg, he made extensive studies in valuation of property. He was elected president of the American Railway Engineering Association at its annual meeting last March.

Howard M. Jones.

William David Pence, Mem. Am. Soc. C. E., was born at Columbus, Ind., November 26, 1865, and was educated at the University of Illinois, where he took the degree of civil engineer in 1895. For six years he was assistant engineer and resident engineer on the Atchison, Topeka & Santa Fe. For eight years he was a teacher and a professor at the University of Illinois; for another eight years, 1899-1906, he was professor of civil engineering at Purdue University. Since 1906 he has been professor of railway engineering at the University of Wisconsin, and also chief engineer of the Wisconsin State Railroad Commission and the State Tax Commission, where he has had extensive experience in valuation work. Professor Pence has for years been the editor of the publication of the American Railway Engineering Association, and has been a member of numerous engineering societies.

John Stephen Worley was born at Oak Grove, Mo., in 1876, and was educated at the University of Missouri and the University of Kansas. He took his bachelor's degree in engineering at the latter university in 1903 and his master's degree in 1904. Mr. Worley has had considerable railroad experience—chief engineer on the construction of the St. Louis & North

Arkansas, chief engineer of the Kansas, Oklahoma & Southwestern and of the Fort Scott & Pittsburg—but the more important part of his career has had to do with municipal and other public service enterprises. For some time he was principal assistant engineer on municipal improvements and appraisals for the Riggs & Sherman Company, consulting engineers, Toledo, Ohio. Mr. Worley went to Kansas City in 1909, where with E. B. Black, he formed the firm of Worley & Black, consulting engineers. This firm has designed and supervised the construction of municipal improvements at many places throughout the central states, and during the past two years has appraised the property of a number of public utilities. Mr. Worley took part in an examination of the physical properties of the Central of Georgia and the Buffalo, Rochester & Pittsburgh railroads; and in 1912 was engineer in charge of an investigation of the methods of operation and accounting of the Delaware, Lackawanna & Western.

Howard Murfree Jones, Mem. Am. Soc. C. E., was born in Murfreesboro, Tenn., October 9, 1874, and was educated at Vanderbilt University, Nashville, Tenn., and at Union College, Schenectady, N. Y., graduating at Union in 1895 with the degree of bachelor of engineering. Mr. Jones has had eleven years' experience in railroad work, having entered the service of the Nashville, Chattanooga & St. Louis in October, 1895. He served in the chief engineer's office of this road at Nashville for seven years, rising to the position of assistant engineer. He left the road and for a year was with the Louisville Bridge & Iron Company as assistant bridge engineer, but he then returned to the railroad and from 1903-1907 was bridge designer and bridge engineer. He opened an office as consulting and designing engineer in Nashville in January, 1907, and during the six years since that time has designed and built a large number of bridges, including two across the Cumberland River, at Nashville, which, together, cost over a million dollars. Mr. Jones was for eight years secretary and treasurer of the Engineering Association of the South, and has been president of that association.

HEARING ON ELECTRIFICATION IN CHICAGO.

The Chicago City Council Committee on Railway Terminals held a hearing on May 12, on a proposed ordinance to require the substitution of some other power than steam locomotives for the operation of the Chicago terminals. The position of the railways toward such an ordinance was presented in a lengthy statement signed by the executive officers of the principal Chicago roads, explaining the differences in conditions in the terminals of Chicago and in those of other cities where electrification has been tried, and asking the committee to defer final action on the pending ordinance until the conclusion of the extensive investigation which has been under way for the past two years by the Chicago Association of Commerce Committee on Smoke Abatement and Electrification of Railway Terminals. The statement, which was presented for the roads by Attorney Robert Redfield, is as follows:

"Your committee have pending before you, for consideration and report, an ordinance in reference to the electrification of terminals in the city of Chicago.

"Before you act upon this proposed ordinance we think that it is due you to know the attitude of the railroad companies represented by the undersigned. We also write you because we are confident that there are considerations of importance affecting the interests of the city as a whole, concerning which we believe you would desire to be informed.

"Permit us, first, to mention briefly the attitude of our railroads toward the subject under consideration. We recognize the desirability of eliminating or reducing to a minimum the creation of smoke in the city, and particularly in the residence districts, and the congested centers of population. We have for some time been seeking a solution of the problems entering into this question.

"No further proof of our good will and sincerity in this matter is needed than reference to the fact that, at the invitation of the Association of Commerce, we joined it in the formation of a committee, upon which we had only minority representation, created for the study of the problems of smoke elimination, and the replacement of steam by other power; that the railroads have furnished all of the money to defray the expense of this investigation, for the reason that the necessary preliminary study, if conducted independently, could not be made to cover in so thorough and unbiased a way the complexities of the enormous business interchanged daily between the commercial interests through the railroads. We have turned over to this committee all the data in our possession, or desired, bearing upon this subject, consisting of plans of tracks, yards, terminals, interchange and industrial tracks, coal consumed, number and kind of locomotives in use and daily mileage thereof, as well as data upon many pertinent and technical subjects and operating conditions—the latter embracing the tonnage of freight received and forwarded, both by the carload and through freight houses, also the number of passenger trains, covering the past ten years' operations.

"It ought not to be overlooked that the Association of Commerce committee has been, for nearly two years, pursuing a thorough, systematic and uninterrupted study of this important question; that it is making marked progress in the performance of the duties entrusted to it; and that when it completes the labors of its investigations its conclusions will be entitled to that respect and confidence which the character of the committee and the thoroughness of its study of the subject will command.

"The second consideration which we desire to submit to you is that in Chicago the railroad situation is entirely different from that in any other part of the United States where electrification of terminals has been attempted. Chicago has had a phenomenal industrial growth. To keep pace with this growth the railroads have been under the necessity of laying tracks under all sorts of conditions. The demands for service have compelled junction and interchange tracks, grade crossings, elevations, inclines and depressions. The requirements of new industries located in all parts of the city have been and are so irresistible that good engineering and economic operation have been given secondary consideration. As business has increased by leaps and bounds, new tracks, cross-overs and grade crossings have become so numerous that there has grown up a net-work of steel rails in many localities so intricate and interrelated that only the oldest and most experienced employees now know all the properties of their respective lines. In other cities the railroad companies generally keep to their own properties, but in Chicago there is a peculiarly free exchange of business. The locomotives of one line are permitted to go on the rails of other lines, anywhere that business necessities demand. Coal is supplied for almost daily necessity, with dependable regularity, lumber comes in and is switched to the yards in a few hours, and distributed to the factories with the same dispatch as other and more concentrated raw materials. The orders of jobbing houses, filed one day, are on the road to the consignee the next. Daily trains of merchandise, stock, fruit and vegetables are taken to the congested centers of the city, unloaded, reshipped or sold locally, in a few hours. The commercial supremacy of Chicago has been brought about through the superiority of its transportation facilities. Unlike New York, with its hundreds of miles of docks and wharves, the merchants of Chicago depend almost entirely upon the railroads for service, and get it. Commerce and transportation are closer together in Chicago than in any other large city in the United States or in the world. It is a shorter distance from the shipping room to the carrier on an average than in any other commercial center, and the business activities radiate to greater distances by reason of such advantages. This unique and peculiar condition of freight terminals, brought about by this rapid growth and the necessity of prompt interchange between railroads, differentiates the condition here from that

obtaining in other places where electrification of freight terminals has been proposed.

"The difference is illustrated by New York, which is Chicago's principal competitor, and which has also been frequently referred to as more progressive than Chicago in the matter of electrification. Among the important points of difference between the railroad terminals of the two cities and their approaches are these:

"First: The geography of the city of New York brings the railroad tracks into the terminals through tunnels and along comparatively straight paths, with few crossings and no interchange, whereas in Chicago the tracks converge into the city from nearly all directions, and over many crossings.

"Second: At the present time practically no freight is handled by electricity in the city of New York, and in the two instances where a comparatively small number of freight cars are handled there is no interchange. In Chicago there is an interchange of 25,000 freight cars a day, and 65,000 cars of freight are daily moved into the city. The subject of freight terminal electrification in New York City is now a matter of study, and no conclusions have been reached.

"Third: In so far as electrification has been adopted in New York City, it was necessitated by tunnel conditions and the character of the passenger terminals.

"The foregoing brings us to a suggestion, that the consequence of an erroneous determination of this complex problem, by a superficial consideration, will be most serious to the commercial and industrial interests of this city, and prudence would seem to dictate the wiser course of completing the systematic investigation now well under way by the Association of Commerce. Chicago owes her supremacy, in the competitive race, to the superiority of her facilities for moving freight by rail, and to the extent that these facilities are impaired, her supremacy will be lost to her competitors.

"We therefore respectfully request that your committee defer final action upon the pending ordinance until the committee of the Chicago Association of Commerce has completed its labors and prepared its report upon the whole subject matter.

"In the meantime, the railroads are not only co-operating with that committee, but are also co-operating with the Bureau of Smoke Prevention of the City of Chicago, and have made substantial progress in the elimination of smoke. In detail, a few of the measures adopted for the reduction of smoke are as follows:

"The organization of a staff of officers, in the city of Chicago, who inspect the operation of locomotives, and instruct the enginemen as to the reduction of smoke;

"The equipment of switching and road locomotives with air jets, superheaters and mechanical stokers;

"The use of a better grade of coal;

"The use of improved front end devices, whereby the amount of cinders and dirt carried into the open air has been more than cut in two;

"The construction of new boiler plants, with furnaces built under the recommendation of the City Smoke Department.

"The result, as shown by the official records of the Bureau of Smoke Prevention of the City of Chicago, is a reduction of smoke, from a density of 23 per cent., in 1910, to 7 per cent., in 1912, an accomplishment to which the chief inspector refers as 'a most wonderful and satisfactory improvement.'

"We beg leave to assure your committee that we shall continue to give unremitting and sincere efforts to the elimination of smoke, and to the perfection of plans for the substitution of other power in place of steam."

The statement was signed by: Chicago, Burlington & Quincy Railroad, by D. Miller, president; Chicago & North Western, by W. A. Gardner, president; Chicago, Milwaukee & St. Paul, by A. J. Earling, president; Pennsylvania Lines, by J. J. Turner, vice-president; Illinois Central, by W. L. Park, vice-president; New York Central Lines, by J. J. Bernet, vice-president; Atchison, Topeka & Santa Fe, by E. P. Ripley, president; Chicago, Rock Island & Pacific, by H. U. Mudge, president.

Howard Elting, president of the Chicago Association of Commerce, also presented a statement outlining the position of the Chicago Association of Commerce toward the investigation, and strongly urging the committee to postpone consideration of the question until the final report of the committee is issued. He said that by January 1, 1914, the committee will be in a position to report something tangible and definite as a solution of this important problem, and that if, on the other hand, the railroads should be forced suddenly to abandon steam and adopt electrification, it is altogether possible that a serious disorganization of Chicago's shipping facilities would result. He outlined the reasons which led the Chicago Association of Commerce to appoint the committee consisting of nine men named by the association, four by the mayor of Chicago, and four by the railroads, because of the necessity for a thorough scientific investigation which would make possible a report so conclusive that it must inspire the public confidence. He declared that the electrification of the railroad terminals in Chicago constitutes a problem that is unique in the United States, because the terminals of Chicago's 38 railroads are bound together by constant intercommunication into a complex network with which no other city in the world has anything to compare, a situation existing because Chicago has the most excessive railroad facilities in the world. The best interests of the city demand that the question be solved correctly for the public in question, and business interests in particular must ultimately bear the expense of hundreds of millions of dollars, and must either benefit or suffer by the effects of any changes in the operation of Chicago railway terminals. It is the part of wisdom, therefore, to inquire fully into the returns of this big investment and to make certain that it will be a good business proposition for the city of Chicago. He felt confident that the work of the association's committee during the past two years represents more actual progress toward the solution of the smoke problem than has been recorded in any other equal period of the city's history. The entire cost of the investigation, which up to the present time has been about $250,000, is being borne by the railroads, and they exercise no control over the course of the investigation other than their proportionate representation of four out of 17 members. The value of the investigation will be measured by the completeness of the information upon which its conclusions will be based, until its complete conclusions are impossible, and any results considered apart from all the other findings of the investigation are without practical value. He believed that the most direct road to the solution of Chicago's smoke problem is that followed by this investigation.

He was followed by Judge Jesse G. Holdom, chairman of the Chicago Association of Commerce committee, who outlined in detail the progress of the investigation thus far, and the work that remains to be done before a report can be rendered.

O. Monett, chief smoke inspector of the city, declared that he was familiar with the work of the committee, and that any action on the proposed ordinance at this time would be immature and ill-advised. He said that the railways were not taking advantage of the time required by the investigation to delay the abatement of the smoke nuisance, but are making every effort that can be made under present conditions to reduce the amount of smoke. The percentage of locomotive smoke density has been reduced from 23 per cent. in 1910 to 7 per cent. in 1912, and the railways are now employing more smoke inspectors than the city, and spending more money to reduce the smoke from their locomotives than the city is spending for all the smokestacks in the city. The committee announced that a series of further hearings will be held on the subject before any conclusion is reached.

Railroads in Belgian Congo.—The Mayumbe railroad, which goes north from Boma, Belgian Congo, is now being operated for over 70 miles, and it is stated that eventually it will serve the Minduli copper mine, in French Congo. The latter is now, however, connected by a light railroad 95 miles long, with Brazzaville, a town on the French side of Stanley Pool, where connection is made at Kinshasa.—*Mining and Scientific Press.*

ANNUAL MEETING OF THE AIR BRAKE ASSOCIATION.

Last Two Days' Proceedings—Papers on Triple Valve Operation, Air Hose Failures, and Location of Steam Heat Traps.

A report of the firts two days' sessions of the Air Brake Convention was published in the *Railway Age Gazette* of May 9; following is an account of the remainder of the convention.

WILL THE TRIPLE VALVE OPERATE AS INTENDED?

A paper on this subject was presented by S. W. Dudley, of the Westinghouse Air Brake Company, who outlined in the first part the various external and internal conditions that affect the operation of the triple valve. The most important feature of the paper was a report of tests made by representatives of the Pennsylvania Lines and of the Westinghouse Air Brake Company to determine, comparatively, the effect of the more common circumstances affecting the service operation of the triple valve in modern passenger train service. A primary consideration was the relative effect of 1 in., 1¼ in. and 1½ in. brake pipe on the release, the service and the emergency functions of the quick action triple valve. Other considerations were the effect of main reservoir pressure, compressor capacity, design of triple valve, kind of service brake applications, use of full release position, single and double brake equipment per car, condition of triple valve, rate of recharge of auxiliary reservoirs permitted and brake pipe leakage. An abstract follows:

The tests were made on a 12-car train test rack of double PM-1612 equipments including one complete No. 6 ET locomotive brake equipment, located out of doors at the plant of the Westinghouse Air Brake Company, Wilmerding, Pa. The apparatus was arranged so that any desired combination of conditions with regard to compressor capacity, size of brake pipe, arrangement of equipment or manipulation could be readily obtained. Standard (not extra heavy) pipe was used in all cases. The test rack duplicated, as nearly as possible, train service conditions.

The triples first used were taken from stock and had been operated on the rack, more or less, for about two weeks, and were by no means in a uniform condition. They, therefore, represented as nearly as possible, the condition which might be expected on a train equipped for service.

With a 6-lb. train pipe reduction some of the brakes failed to apply. Six tests were made with a 1 in. and 1½ in. train pipe; 74 per cent. were applied with the 1 in. pipe and 77 per cent. with the 1½ in. pipe. In the release test 16 per cent. failed to release with the 1 in. pipe and 17 per cent. with the 1½ in. pipe. It will thus be seen that there was no marked difference between the 1 in. and 1½ in. pipe under these conditions.

After the valves were put in good condition (according to the indication of a portable testing truck) not a single brake failed to apply (except on the very light 4 and 5-lb. reductions), and only a relatively small number failed to release. This shows clearly that the condition of the triple valve is an important factor in both the application and release of the brakes; that it may be the determining one; and that any improvement in the condition of the valves will assist in preventing improper operation of the brakes. Therefore, the tests referred to up to this point in which the influence of the triple valve itself was evidently the predominating factor, will not be used in comparing in detail the effect of different sizes of pipe and other factors.

As a means of comparison the rate of rise of brake pipe pressure on the last car in the train was taken as the standard, as it is directly and primarily affected by the conditions to be compared.

When releasing brakes and increasing the pressure in the brake pipe, it was found that a 1½ inch pipe produces no improvement, and on the whole is less satisfactory than a 1¼ inch pipe in this respect. The time to increase the brake pipe pressure 5 lbs. on the last car in the train is practically the same as the 1¼ inch pipe.

The effect of 1½ inch brake pipe in service applications was found to considerably delay the time of obtaining full brake cylinder pressure corresponding to the reductions made on the train as a whole, but at the same time cause a more uniform starting of the application of all the brakes. The average time to obtain maximum pressure in making a 20 lb. reduction with the 1½ in. pipe was 24.6 seconds, which is 5 seconds, or 25 per cent. longer than for the 1¼ in. pipe and 10 seconds, or 70 per cent. longer than for the 1 in. pipe.

While the use of 1½ in. pipe slightly increases the emergency brake cylinder pressure, it seriously interferes with the obtaining of serial quick action, especially with the brake (both triple valves) on the car next behind the locomotive cut out. The brake cylinder pressure in emergency is increased 6 lbs. or 7.7 per cent. above that obtained with the 1 in. pipe and 4.5 lbs. or 5.8 per cent. above that with the 1¼ in. pipe. The 1½ in. pipe offers no appreciable advantages over the 1¼ in. pipe and does introduce some distinctly undesirable features.

The record of the brakes released with the 1¼ in. brake pipe is slightly better than with the 1 in. pipe. Its advantages in this particular are so slight as to be negligible in comparison with the much more marked differences produced by the use of other means. The time to increase the brake pipe pressure 5 lbs. on the last car is, under all conditions, less with the 1¼ in. pipe than with the 1 in. pipe. This should result in a corresponding improvement in releasing brakes. The summary of the tests chosen as representing conditions where some brakes are close to the "sticking point," shows that for the 1 in. pipe out of a total of 432 possible stuck brakes 6.5 per cent. were stuck for 10 seconds and 3.7 per cent. stuck for 60 seconds. The substitution of a 1¼ in. pipe for a 1 in. pipe, other conditions remaining the same, reduced these percentages to 1.6 per cent. and 0.9 per cent. respectively. The percentages for 1½ in. pipe were 1.2 per cent. and 1.2 per cent. respectively, showing no appreciable gain over 1¼ in. pipe. However, on the whole, the difference between the effect of 1 in. and 1¼ in. pipe on the release of the brakes was not sufficient to indicate that the larger pipe would materially assist in releasing the brakes under otherwise unfavorable conditions. That is to say, the substitution of a 1¼ in. brake pipe for a 1 in. brake pipe could not be expected to produce any marked improvement under conditions which would otherwise tend to cause stuck brakes, although its tendency is unquestionably in this direction.

The effect of a 1¼ in. brake pipe in service applications is to somewhat delay the application of the brakes on the train as a whole, but at the same time produce a more uniform starting of the application of all the brakes. With a 1¼ in. brake pipe the time to start the application of the brakes on the twelfth car is practically the same as for the 1 in. pipe. The time to obtain maximum pressure in making a 20 lb. reduction is 19.6 seconds, which is 5 seconds longer than with the 1 in. pipe.

The use of the 1¼ in. pipe slightly increases the emergency brake cylinder pressure, but tends to hinder serial quick action. This interference with quick action, however, was not appreciable except under the more severe conditions; which conditions were, however, not sufficient to affect the obtaining of quick action with the 1 in. pipe. The emergency brake cylinder pressure is increased 1.5 lbs. or 2 per cent. above that with the 1 in. pipe. The time of transmission of quick action throughout the train is not appreciably affected.

The use of a 1¼ in. pipe would tend toward improvement in releasing brakes, would be a distinct economic advantage (due to having but one, instead of two standard sizes of air brake hose and fittings to be kept in stock and handled) and would not be objectionable, either on account of a slower service application or its effect on quick action except under extreme

conditions. However, it could not be expected to entirely eliminate the troubles heretofore experienced with double equipment cars, other conditions remaining unchanged, and is of much less benefit than a number of the other factors, such as manipulation, main reservoir pressure, and so on as mentioned in this report.

As would be expected, with low main reservoir pressure and short time in full release position there is not much difference in the results with different size pipes, but with the higher (140 lbs.) main reservoir pressure the effect of large size pipe is marked. With 140 lbs. main reservoir pressure, for all reductions and times in full release position, the difference between the brake pipe pressure on car 1 and on car 12 with 1¼ in. pipe is half or less than half that with 1 in. pipe. With other conditions the same, the 1¼ in. pipe permitted the brake pipe pressure on the last car to rise to a higher point than did the 1 in. during the time the brake valve handle was in full release position.

Concerning the use of 1 in. and 1¼ in. pipe on the locomotive, it was found that there was no appreciable difference. The larger size brake pipe permits a greater amount of air loss by leakage without causing an application of the brakes.

Discussion:—P. J. Langan (D. L. & W.) stated that he had found it impossible to make 5 lb. reductions without brakes sticking. Mr. Turner explained that that was on account of the large auxiliary reservoirs used on the D. L. & W. which allow the brake to set sufficiently to cause a stuck brake, there being enough pressure in the brake cylinder to make some appreciable brake application and too much pressure in the auxiliary reservoir to permit the triple valve to go to release position when the train line was recharged. With the smaller auxiliary reservoir this difficulty would be overcome.

AIR HOSE FAILURES.

A paper on this subject was read by T. W. Dow, of the Erie. An abstract follows:

Several roads are making an accurate check of the cost of damage due to burst hose, intending to bring it before the M. C. B. Association to use as an argument for establishing a positive time limit in which to remove all hose from service. While the cost of such a practice might seem unwarranted and excessive to many, when it is compared with the cost of damage to equipment from the failure of the air hose it will be found that there will be a balance in favor of this practice. In checking several thousand 1⅜ in. air hose that had failed due to bursting, during the year of 1912, the average life was found to be less than 20 months, and a small percentage of the number had been manufactured over 24 months; and it has been suggested by a number of mechanical officials that under the existing conditions it did not appear to be unreasonable to limit the service of air hose to the latter figure, or 24 months.

In making the stretching test on 1 in. sections of various inner tubes it was found that some developed noticeably large holes which at first were very small. These were due to particles of grit which were seen in the rubber before being stretched. It is believed that such conditions account for the large number of porous hose. It is maintained by many, however, that the practice of pulling hose apart is responsible for short life and it is possible that the pulling apart has a tendency to opening up the pores in the inner tube similar to the conditions developed in the stretching test.

During the soap suds test of the air hose on a large number of trains during the warm season of 1912, it was found that about 10 per cent. were porous. A large portion of this number were porous throughout the entire length of the tube, but many were noticed leaking only at the nipple end, having been made so probably by being bruised, and it is thought that this may be aggravated by the new recommended location of the angle cock, 11 in. back of the pulling face of the knuckle.

While a large number of air hose fail due to the tube blowing off the fittings, a check during the year 1912 showed a lesser number than during the year of 1911. This may have been due to a local condition rather than to any improvement in the make-up of the inner tube, or to the method of fastening, but it is thought that serious consideration should be given to both.

Failure through chafing, being burned, torn off and damaged couplings, still continues, but all such can be eliminated by proper attention to the location of the pipes and a regard for a rule that has been many years in print, but not in force, whereby all hose should be uncoupled and not pulled apart. From examination made, it would appear that air hose manufactured within the two years just passed fail more rapidly than those manufactured four or five years ago.

Discussion.—H. F. Wood (B. & M.) presented some figures on the life of air brake hose that showed that two years would be a practical limit to keep hose in service.

T. E. Hessenbruch (P. & R.) stated that out of 1,200 pieces of defective hose taken from the scrap pile and given a pressure test of 125 lbs., 54 per cent. were porous, having been in service on an average of 18 months; 24 per cent. failed on the nipple end and 11 per cent. on the coupler end; 3 per cent. were weather beaten, being in service on an average of 48 months; 1 per cent. were cut by trap; 1 per cent. were torn, and 6 per cent. had miscellaneous failures. He also stated that considerable trouble was experienced from rust collecting in the groove of the coupling which prevented the gasket from having a good bearing.

F. B. Farmer spoke of the stiffening effect extreme cold has on poor hose which greatly interferes with successful train operation, tearing the hose gaskets and increasing train pipe leakage. Other speakers mentioned similar troubles from frozen hose, and C. W. Wheeler (N. Y. C. & H. R.) has found it necessary to wire the hose together at temperatures in the neighborhood of 20 deg. below zero.

C. N. Remfry (D., M. & N.) stated that his road made a practice of limiting the life of air hose to two years—although the average life was 2 years and 2 months—and claimed a material saving when considering the damage that is done to the equipment by hose failures. He also found that the hose gave better service when the distance between the coupler knuckle and angle cock key was 11 in.

The subject was continued to next year.

LOCATION OF STEAM HEAT TRAPS.

C. W. Martin (Penna.) presented a paper on this subject. An abstract follows:

To the air brake inspector in charge of equipment, who is called on to give an explanation of the cause of removal of wheels from passenger equipment cars which have been slid flat, the disposition of the water of condensation from the steam heat trap or drip becomes a serious problem. This condition has been considerably aggravated by the introduction of the steel car, which requires the number of square feet of heating surface to be more than doubled; this increases the amount of condensation to be discharged at the traps and usually requires more traps, due to the radiators being broken up into smaller units, because of the increased length of the vehicle.

On postal and Pullman cars the number of steam traps has been increased from one or two with the wooden car, to six or seven with steel equipment, and these are located close to the truck, where the condensation drops on the rail directly in front of the wheel, or is blown back on the truck and brake rigging to freeze and add to the rigidity of the parts, preventing that portion of the truck which should be free to move in order to maintain an equal distribution of the weight of the car on the rail, from adjusting itself to the inequalities of the track. This relieves some of the wheels of their proper proportion of the weight at the time the brake is applied, and permits them to slide.

Where the traps cannot be located away from the truck or triple valve, some arrangement should be made to conduct the condensation close enough to the track to prevent flying back under the car. A sheet iron tube clamped to a trap of the verti-

cal type conducts the water from the trap down close to the track, and where the trap is located near the center of the car, gives good satisfaction.

A guard placed around the trap on the side nearest the part to be protected, and fastened to the trap by a clamp held in place by a stove bolt or machine screw, will also be helpful. The shield may be made from heavy sheet iron stiffened by a rib of half-round iron along the edge, or by flanging it over a heavy wire. While the object of this shield is to protect the truck from water and still allow the atmosphere free access to the trap, in order that any variation in temperature may affect it promptly, it has been criticized somewhat because of the water blowing around the edges of the guard, because of it being wide and shallow.

A device made up from rubber hose, 4 in. in diameter, clamped to the trap and run as close to the track as desired has also been found satisfactory. Where it is necessary to locate the traps outside the rail, this arrangement is preferable to either of those mentioned above. This is especially true when the cars are to be run in an electrified zone, where the third rail is used, as the hose is very flexible, not easily injured by striking any obstruction, and is a non-conductor.

This matter is one which should be taken up by the car designers and builders, with a view to having these traps located at some point as far from the track as possible, and where this is not possible, to provide a suitable shield or guard to protect the brake rigging and equipment.

Discussion.—The discussion confirmed the troubles mentioned in the paper. M. Purcell (N. P.) stated that the brake rigging had in some cases been rendered inoperative by the ice from the drip.

OTHER BUSINESS.

The convention was addressed by J. F. Enright, superintendent of motive power and equipment of the Denver & Rio Grande. He spoke of the difficulties he experienced with cars received from valley roads where it was not as necessary to maintain the air brake system at such a high rate of efficiency as on mountain grades. The greatest trouble was found in lack of proper retaining valves.

The executive committee voted as the sense of the association against the formation of a supplymen's association to work in conjunction with the Air Brake Association, desiring to furnish their own entertainment at the conventions.

The following officers were elected for the ensuing year: W. J. Hatch, Canadian Pacific, president; L. H. Albers, New York Central Lines, first vice-president; J. T. Slattery, Denver, & Rio Grande, second vice-president; T. W. Dow, Erie, third vice-president; F. M. Nellis, Westinghouse Air Brake Company, secretary, and Otto Best, Nathan Manufacturing Company, treasurer.

JAPANESE LOAN FOR RAILWAY BOND REDEMPTION.—Arrangements have been practically concluded for the issue in Paris shortly of a Japanese loan of $38,500,000, of which $35,000,000 will be devoted to the redemption of railway bonds. The rate of interest will be 5 per cent.

MEASURING TRAIN SPEED IN 1832.—A locomotive steam engine, constructed by Davis and Garther, of York, Pa., commenced her operation on the Baltimore & Ohio Railroad under the most favorable auspices on Tuesday. It started from the Pratt street depot for Ellicott's Mills, with the entire train destined for that place, consisting of 14 loaded cars, carrying, together with the engine tender, a gross weight of 50 tons. The whole went off in fine style and was soon out of sight. A gentleman present says it was out of sight of the depot in about six minutes, and the rapid gliding of the immense train was one of the most imposing and most beautiful spectacles he ever witnessed.—*Extract from the National Gazette, published in the American Railroad Journal of July 28, 1832.*

DEDICATION OF NEW BUILDINGS AT UNIVERSITY OF ILLINOIS.

The new transportation building and the new Locomotive and Mining Laboratories of the Engineering Department of the University of Illinois were dedicated with appropriate exercises at Urbana, Ill., on May 8, 9 and 10. At the opening session on May 8, J. G. Pangborn, special representative of the president of the Baltimore & Ohio, presented an address outlining the history of the various inventions which led up to the use of steam for propulsion and the development of the various types of the steam locomotive.

The program for Friday began with a railway conference in the Transportation building, at which B. A. Worthington, president of the Chicago & Alton, discussed "Modern Problems of the Steam Railway," and W. B. McKinley, president of the Illinois Traction System, "The Modern Problems of the Electric Railway." Mr. Worthington dealt with the serious situation in which the railways find themselves on account of restrictive legislation speaking in part as follows:

"In enjoying the splendid results which actually have been materialized under the conditions which have prevailed, one can scarcely believe that there possibly could be anything so seriously wrong with the railroads themselves, nor with the primary conditions under which the railroads have been operated; not that governmental control is undesirable to the railroads, for in fact it is highly desirable when properly exercised, but the sixteen billion dollar institution of the railroads, erected almost entirely by private subscription, is a national asset of far too great an economic value to be meddled with indiscriminately, or to be hampered by ill-advised legislation which caters to public prejudice and thrives upon public credulity and public passiveness. The truth of the matter is the public has not yet been brought face to face with the really serious condition of affairs that actually exists, nor to a realization of the dominant fact that the public, regardless of the actual investment of not a single dollar in American railroad properties, collectively holds the controlling interest in these railroads, and accordingly enjoys the greatest dividend returns.

"While enjoying the fruits of prosperity, the public—that is, those not directly interested in the finances of railroad properties—while depreciating the values and hampering the service of the railroads, seem to place a great abiding confidence in the stability of other values. As a matter of fact, the railroads being the chief instrumentality in creating such other values, still constitute the *real value underlying such other values.* If, for example, the railroads should be withdrawn, these artificial or contingent values would quickly collapse; and in the exact proportion that these railroads *are* withdrawn, through inefficient or inadequate service, such other values shall certainly depreciate.

"When we stop to consider the precarious situation of the railroads, the very values which underlie our government bonds themselves, the endowment values upon which have been constructed public institutions without number, the foundation and the buttress of our national strength and our national greatness, serious doubt arises.

"But the question is, how much more radical legislation will be required to convince the people that the situation is fast becoming insufferable? In plain words, how much longer are the people going to stand for this revolutionary state of affairs? Are they so blinded by prejudice that they cannot, or rather will not see the error of their way until it will be too late? Passing years will prove convincingly whether 'prudence,' indeed, has been consulted in our present legislative functions. Already indications are becoming apparent to the trained eye that *something* is wrong. Railroad securities, our letters of credit abroad and incidentally the strongest national defense that any nation ever erected, are being returned to us under protest and subject to severe discounts which we ourselves are imposing. Again I ask the question, has prudence been con-

sulted, and is confidence protected as *you* want it protected?

"Are we not even now changing a form of government long enough established to produce a wealth of $100,000,000,000 in substantially forty years and place us in the foremost ranks of all the nations of the world? And are not these changes due to 'light and transient causes' in the intended and accepted sense of the expression? In plain words, are we not 'killing the goose that laid the golden egg'?

"A railroad plant is not totally unlike any other kind of a plant. It is an organic structure which is supposed to grow, and it thrives best under cultivation. But who would think, for instance, that he could raise more wheat to the acre by heaping upon productive fields all sorts of rubbish that prejudice could conceive, and in addition thereto, passing laws that the kernels shall be larger and the stalks shorter? This seems very much like an absurdity, but I ask you in all sincerity, is it not a pertinent analogy?"

"The Changing Character of the Problems of the Railroad" was discussed by T. H. Goodnow, president of the Western Railway Club, who outlined the progress that has been made in railway mechanical work, especially in the car department. He said that there is a lack of the right sort of young men entering the shops of the railways today and it is becoming more necessary to depend upon immigrants.

Albert Reichmann, president of the Western Society of Engineers, spoke on "The Technical Society as an Influence in Education."

"It is very evident," he said, "that an engineer in order to be successful cannot be a recluse. He must associate with his fellow engineers. He can best secure such association through the technical societies. The meeting of engineers under conditions where all are on a common footing fosters a siprit of kindly co-operation and helpfulness which binds them together and makes each of greater usefulness to the others.

"In the technical societies the various steps of mechanical development are depicted both from the practical and theoretical standpoints. They afford the engineer an opportunity to supplement his own knowledge by the experience of his fellow engineers. They afford him the opportunity to present to the world what he himself has accomplished and to receive criticisms and suggestions from his fellow men and resulting from the discussion of the various subjects which are presented the engineer learns to appreciate the benefits of co-operation; by means of which both the giver and receiver are greatly benefited."

H. G. Hetzler, president of the Chicago & Western Indiana, spoke on "Proper Aims in Training for Railway Service."

W. L. Park, vice-president of the Illinois Central, was unable to be present, but sent an address on "Vocational Education in Connection with Railroad Work." He said in part:

"The magnitude and ingenuity of the great progressive achievement of our railroads has been so wonderful and the results so beneficial and far reaching that we have, to a great extent, lost sight of the necessity of economizing; we must now take cognizance of the terrific waste and crude methods, and begin to apply the scientific methods.

"We must bring about a better system of activities before we have wasted our birthright of natural resources. This power of efficiency must come out of institutions of this character—with their equipment for experimentation and ability to explore the world for knowledge and to make it available to the student.

"I would not deprecate in any way all that is intended by these great schools of special training. There are too few of them, and those that do exist are frequently restricted in their accomplishment by lack of funds to do all that the faculty have in mind.

"I would, however, impress upon those who are responsible for the future prosperity of our railroads, the importance of maintaining a proper balance in the human equation—we must not forget the thousands in the ranks who are deprived of the very rudiments of learning, upon whom we must yet continue to place great responsibilities. The knowledge, concentrated in our educational institutions, should be made available in some degree at least to those deprived of the advantages until there comes a time of more equal opportunities; some system of education yet to be evolved that will give to those seeking knowledge of this vocation an opportunity while employed in a gainful occupation, to acquire it."

Robert Quayle, general superintendent of motive power of the Chicago & North Western, spoke on "How Can the Technical School Help in the Solution of Railway Problems?"

Samuel O. Dunn, editor of the *Railway Age Gazette,* gave a brief talk on "Research as a Factor in Railway Administration."

The formal dedicatory exercises were held on Friday afternoon in the University Auditorium. Dr. W. F. M. Goss, dean of the College of Engineering, presided, and addresses were made by Dr. E. J. James, president of the University; W. L. Abbott, president of the board of trustees; and Willard A. Smith, editor of the *Railway and Engineering Review.* A "Mining Conference" was held on Thursday and Friday.

LOCOMOTIVE BOILER INSPECTION.

The following notes are taken from a paper which was recently read before the Western Railway Club by Frank McManamy, assistant chief inspector of the Division of Locomotive Boiler Inspection of the Interstate Commerce Commission.

A statement which is frequently made to us when repairs are ordered on locomotives which do not meet the requirements of the law is, "I do not consider that dangerous." If we refer to Section 2 of the law, we find that Congress was evidently not satisfied with simply requiring that locomotives must be "safe to operate," and in such condition that they were not immediately dangerous, but they must also be "in proper condition," and the rules were provided to show what was meant by "proper condition." This is briefly but completely covered by Rule 7, which provides that "the mechanical officer in charge at all points where boiler work is done must know that *all* defects disclosed by an inspection are properly repaired before the locomotive is returned to service," and this is just what is desired by the most progressive railroad managers. No one can question the fact that defects which are apparently unimportant in themselves often cause serious accidents.

The most frequent objection that has been made to our method of inspection has been that defects are reported which are not violations of the law, resulting in mechanical officers being asked by the managers to explain why such defects were permitted. It seems to me that those who raise this objection must have done so without having given the matter much thought. The purpose of legislation of this character is to promote safety and not to collect penalties. The penalty must be provided, however; otherwise the law might be ignored, and, when necessary, proper action will be taken to enforce it. We have endeavored, however, with very gratifying success, in most instances, to obviate the necessity of bringing suits to collect penalties, by reporting all defective conditions found, so that they might be repaired before they became serious enough to cause injury, or to violate the law. This policy can only be successfully followed on roads where a sincere desire exists and an honest effort is being made to comply with the requirements of the law.

Section 6 of the law provides that the "first duty of the district inspector shall be to see that the carriers shall make inspections in accordance with the rules and regulations established or approved by the Interstate Commerce Commission, and that the carriers repair the defects which such inspections disclose before the boiler or boilers, or appurtenances pertaining thereto, are again put in service." This requirement makes the principal work of the government inspector of a supervisory character, and plainly shows that the intention of Congress was to place the burden of inspection and responsibility for the condition of locomotives upon the carriers.

The law provides that the district inspector "shall make such personal inspections of locomotive boilers under his care as may

be necessary to fully carry out the provisions of this act, as may be consistent with his other duties," and this is being done, but where attempts are made by any railroad to shift the burden of inspection onto the government by continuing defective locomotives in service until the defects are discovered and ordered repaired by a government inspector, it will be necessary to resort to the penalties provided in Section 9 of the law, as the law did not intend nor provide sufficient force for the government to do this work alone.

I have frequently heard the statement made that a defective locomotive could be continued in service without incurring a penalty, until ordered out of service by an inspector. In our opinion, this is not the correct view. Section 9 of the law provides a penalty for three distinct acts: First, for violating the act itself; second, for violating any rule or regulation made under its provisions; and third, for violating a lawful order of an inspector. Under these provisions railroads are just as liable for the penalty if they operate a locomotive in a defective condition which has never been seen by a district inspector, as they are for operating one which has been ordered out of service by an inspector. This for the reason that Congress recognized the fact that it would be impossible for 50 inspectors to know at all times the condition of the 65,000 locomotives in service; therefore, the responsibility for making proper inspections, proper repairs and for the general condition of equipment was placed absolutely on the carriers and a penalty provided for failure to comply, regardless of whether the locomotive had been inspected by a district inspector, or not.

Among the rules which have apparently in many instances been misunderstood are the following: Rules 9 and 10 provide a maximum period between the removal of flues and also require the interior of the boiler to have the scale removed and be thoroughly cleaned and inspected whenever a sufficient number of flues are removed to allow examination. We find that the fact that the period given for the removal of flues is a maximum, is apparently overlooked, and it is assumed that the rule is being complied with if the boiler is scaled and inspected once in three years, even though flues are removed each year or oftener. This is not a proper compliance with the rule, because where water conditions are such as to make a frequent removal of flues necessary, it is reasonable to assume that the same conditions make it important that the interior of the boiler be thoroughly cleaned and inspected in accordance with the rules.

Rule 19 is another one that quite frequently is not fully complied with. It requires that at the time of applying a hydrostatic test the boiler must be thoroughly examined while under pressure. We find the practice to be more or less common of failing to hold the pressure while this examination is made; therefore, defective conditions which could possibly have been discovered while the pressure was on may remain undetected. The practice of screwing down safety valves when applying hydrostatic test could be improved upon, although it is not specifically prohibited by the rules. We have found cases where valves were damaged in this way and they frequently leak, resulting in water running down over the boiler, making it impossible to determine whether the water is coming from the safety valves or from some defective seam or rivet, or from a crack in the boiler shell.

Rules 45 to 48, governing the washing of boilers, are in many instances not properly observed. Some roads have been following the plan of removing all washout plugs and washing boilers thoroughly only once in 30 days, which is recorded as the government washout, and although water conditions were such as to require numerous other washouts during the month, all plugs are not removed and only a partial washout is given, which is recorded as the railroad company's wash, or a short wash or some similar term. This is not in accordance with the rules. Rule 45 requires boilers "to be thoroughly washed as often as water conditions require, but not less frequently than once each month," and Rule 46 provides that when boilers are washed *all* washout, arch and water bar plugs must be removed.

This does not apply to a water change when only the washout plugs in the water-legs are removed to facilitate emptying the boiler, but where a hose is used to wash sediment out of the boiler, and, perhaps, other washout plugs are removed and the crown sheet rinsed, or the barrel of the boiler partially washed.

Rule 50 is another which apparently has not been fully understood, or at least properly complied with by many carriers. It provides "that all steam valves, cocks and joints, studs, bolts and seams shall be kept in such repair that they will not emit steam in front of the enginemen so as to obscure their vision," and, we believe, covers every point where steam leaks occur. It was intended to insure a reasonably clear view of the track and signals for the enginemen, yet we find many instances where no inspection is made while the locomotive is under steam, which is the only time such leaks can be located, yet a report is certified to stating that all steam leaks have been repaired. Inasmuch as the United States statutes provide a very severe penalty for a wrongful certification on a report of this kind, this places the railroad inspector in a very unpleasant position. The law requires a sworn report of each inspection and of the repairs made as a result of the inspection, and as the inspector is responsible, under the law, for the correctness of the statements to which he certifies, the report should show conditions exactly as he finds them.

Another point, the importance of which is not fully realized, is the responsibility of the man who signs reports as officer in charge. Rule 7 provides that "the mechanical officer in charge at each point where boiler work is done will be held responsible for the inspection and repair of all locomotive boilers and their appurtenances under his jurisdiction. He must *know* that all defects disclosed by any inspection are properly repaired before the locomotive is returned to service." The officer in charge is required to sign the following certification: "I hereby certify that to the best of my knowledge and belief the above report is correct." The rule above quoted, which requires him to know that *all* defects disclosed by any inspection are repaired before the locomotive is returned to service and the certification which he signs places even greater responsibility on him than on the inspector, because, in addition to knowing that the inspection and repairs have been made, he must know that the report is correct. For this reason the officer in charge at points where inspections are made should give more of his time and attention to this work than is frequently done at present.

Proper care and adjustment of safety valves is another matter that does not always receive the attention that it should. Rule 34 provides that "every boiler shall be equipped with at least two safety valves, the capacity of which shall be sufficient to prevent, under any conditions of service, an accumulation of pressure more than 5 per cent. above the allowed steam pressure." This rule does not mean that the government shall design the safety valves, say what make they shall be, or anything of that kind. It simply fixes a minimum capacity below which you shall not go. When we have demonstrated by test that the boiler can generate steam faster than the safety valves can take care of it, we have asked and will insist that the capacity of the safety valves be increased to meet the requirements of the rule. Of the first 500 locomotives on which safety valve tests were made, 58 per cent. had valves which would not relieve the pressure in accordance with Rule 34. Immediate steps were taken, however, to remedy this condition and a material improvement has resulted, but there is need for a further improvement in this direction.

Our policy has been to freely and frankly discuss matters of this kind with railroad officers in order to bring about a better understanding of what we believe the law requires, to the end that the desired improvement may be brought about without the necessity of threshing such matters out in the courts. In this we have been wonderfully successful, due largely to the cooperation we have received from a large majority of the railroad officers of the country.

RAILWAYS OF THE UNION OF SOUTH AFRICA.*

**System of 9,050 Miles Owned and Operated by Government—
Organization, Engineering, Operating and Financial Features.**

By E. R. Lewis,
Assistant to General Manager, Duluth, South Shore & Atlantic.

The birth of the Union of South Africa on May 31, 1910, brought under one management the railway systems formerly owned and operated by the governments of the four separate colonies combined in this South African federation. These are the south coast colonies of the Cape of Good Hope and Natal, and the former Boer colonies which adjoin them on the north, known as the Transvaal and the Orange Free State; or the Orange River Colony, as it was called after the British occupation.

At the time of union, the railway systems of these states included 7,207 miles of single track in operation, while approximately 860 miles were under construction. There were authorized in 1911 an additional 527 miles of extensions, now nearly all in operation so that today the government-owned railways of the Union total some 8,500 miles, exclusive of 545 miles of leased and operated lines. This system of nearly 9,050 miles of railways serves an area more than ten times the size of the state of New York, or 500,000 square miles, with a population of about six millions of people.

The conditions under which this system is operated with conspicuous success are unique. The South African colonies had each its responsible government before the consummation of the present Union, which resulted in the amalgamation of the four governments and their different departments, including those of public works and crown lands. The Department of Public Works and Crown Lands is presided over by a minister of the Union government. That division of the department relating to railways and harbors is under one general manager who reports directly to the minister. Thus the policies of railway construction, maintenance and operation are the policies of the government of the country; the results of parliamentary debate, of political expediency and of ministerial decision. With the union of the four colonies, their dissimilar railway equipments and properties, each born of the necessities of that locality which it had formerly served, were pooled under the new ownership and combined under one management. The heavy traffic of the mining districts of the Transvaal, and of the coal fields of northern Natal had been carried in cars and by locomotives of much greater average capacity than those which transported the live stock and forage of the more pastoral Orange Free State and Colony of the Cape of Good Hope.

THE "AMERICAN" UNIT SYSTEM OF ORGANIZATION.

With this new spirit of combination came the decision to adopt for the Union Railways a form of management somewhat similar, or at least based upon, the unit system of some of our most extensive railways, which came to be known in South Africa as the American system.

That this Americo-African unit system, successor to four highly departmentalized colonial railway managements of many years standing, is quite dissimilar from any American railway management, is not surprising nor indicative of failure.

The retraining of four such lusty orphans, suddenly bereaved, with dispositions ever inclined to disagree in small ways with their next neighbors, now members of the same family, could not be accomplished without some more or less stifled strife and bickering. That so little of bitterness resulted, is a triumph possible only to a nation worthy of those leaders who have guided this republic of the antipodes to its present place among the world powers.

Though at present it presents evidence of being an uncomfortably long step in the right direction, this change should ultimately effect many desired economies. The new railway management was designed primarily to promote efficiency through decentralization. With this end in view, eight divisions of the Union Railways were established. On each division an officer termed a divisional superintendent was put in complete control of operation, engineering, passenger and freight traffic and other details of the running of approximately 1,000 miles of main line.

Furthermore there were appointed three assistant general managers, with jurisdiction over two or three of the eight divisions. Both the divisional superintendents and the assistant general managers are residents of their respective territories, the assistant general managers reporting directly to the general managers at Johannesburg, where are located the headquarters offices.

The assistant general manager at Capetown has jurisdiction over System A, comprising two divisions, with divisional superintendents at Capetown and Kimberley. The assistant general manager at Bloemfontein controls System B, made up of three divisions; while the assistant general manager at Johannesburg has three divisions under his management.

The intention underlying the whole organization was that wide powers of initiative and control should be vested primarily in the man on the spot. Thus, the divisional superintendent is given command of the operating, mechanical, traffic and engineer officers within the limits of his territory. The assistant general managers are intended, of course, to control their several territories in much the same manner as would be done by a general manager of a smaller railway, without interfering in those details of working over which the superintendents exercise executive powers. Thus the general manager is to a great extent relieved of executive matters, and able, therefore, to give his time largely to the larger problems of administration.

All matters pertaining to construction of new lines are under the control of the engineer-in-chief. The survey and construction staff of engineers is extensive, as is necessary in a country of such great area, and a government organization required to investigate the many propositions for new branches which are put before the houses of parliament.

The control of the engineering work on lines under operation being in the hands of the divisional superintendents, the chief engineer is in some measure free to give his attention to consultations, and to act in an advisory capacity to the general manager.

The principles of this organization sound familiar, and are indeed, nearly identical with similar railway organizations of America. The underlying principle is to combat the tendency of all large organizations toward the centralization of control, with the consequent delays owing to lack of authority of resident officers, the multiplication of accounts and the expense and general annoyance of what is commonly called "red tape."

Undoubtedly the results desired in South Africa will be obtained sooner or later if the officers in authority stand by their guns. It is not an easy matter to uproot a bureaucracy of forty years' growth in a government service, much less in four combined government services. That it is being done, however, with advantage to these railways is demonstrable. The difficulties which must be overcome can only be estimated by those familiar with governmental organizations.

Legislative expediency is responsible for the network of wandering branch railway lines which have from time to time been constructed to develop sparsely populated districts of South

*The author of this article acquired most of his information regarding the railways of the Union of South Africa while serving as assistant to their engineer-in-chief.

Africa, sometimes of seeming small future possibilities. Dividends and early returns on capital expended not being so necessary as in the case of privately-owned lines, however, the results of these governmental policies have proved wise, as evidenced by the favorable returns obtained from some of the most arid regions in a few years time.

OPERATION AND OPERATING RESULTS.

Railway operation, or "transportation," in South Africa is distinctly English in method and results. Less than 5 per cent. of the local passenger trains run as much as five minutes off schedule time. Only 23 per cent. of the freight trains run as much as five minutes late per trip. It is safe to say that few railways in America can show such annual records, and these results are obtained in South Africa under conditions unfavorable in many respects, compared with those under which American railways are operated.

The average cost of maintenance per mile per annum of the South African railways is $840, or about 24 cents per train mile. Maintenance of equipment averages 10 cents per engine mile for engines; 13 cents per passenger train mile for coaches, and 11 cents per freight train mile for freight cars. "Running" expenses average about 32 cents per train mile.

For the past ten years gross expenditure has averaged about 62 per cent. of gross earnings, the mileage has about doubled, passenger traffic has increased from 29,000,000 to over 37,000,000 passengers carried annually, and gross freight tonnage has increased from 670,000,000 to 1,110,000,000 tons revenue freight.

The adjustment of freight rates after the consummation of Union of the colonies occupied the attention of government officials for a considerable time, and much of the deliberation had to do with the advisability or otherwise of adopting the basing point system of freight rate making which obtains on the railroads of the southeastern states of the United States. This system was finally and rightly rejected as unsuitable to South African ratings. Both freight and passenger tariffs in that country are influenced largely by the isolated positions of the colonies and by the peculiar topography of the subcontinent.

ENGINEERING CONDITIONS.

The interior of the country is a vast tableland, averaging some 4,000 ft. above mean sea level. The ascent from the coast to the karoo of the hinterland is everywhere abrupt. Each of the few negotiable mountain passes presents serious obstacles to railroad location. The coast divisions of these railways include tunnels, viaducts, rock cuts, heavy grades and sharp curves. The "Cape gage" of 3 ft. 6 in., now the standard gage of the Union Railways, is largely the result of these conditions on the mountain divisions, which were first built without reference to possible extensions into comparatively easy country.

The South African rivers are raging torrents during the short seasons of rain, and dry beds of sand and stone during the remainder of the year when their flow is largely underground. The climate of the karoo is generally delightful, with winters like the crisp October days of our middle states, with once in two or three years a light snow fall. The summers bring hot weather at midday with occasional heavy showers. The nights are very cool. The direct rays of the summer sun are so intense that cross ties are buried in ballast to the railheads to prevent tie checking, and excessive expansion of rails.

These climatic conditions are due to altitude, to latitude, and to the effects of the cold Antarctic ocean current, which follows northward close to the west coast; as well as to the warm Indian ocean current which laves the southeast coast from Zululand to the Cape Peninsula. Frost is left out of reckoning in railway work. Water tanks are open topped. Water pipes may with impunity be laid on top of the ground. Heaving track is an unknown condition. A snow storm is a rarity even in the mountain districts. The sun shines during more days of the year than in almost any other country in the world. The vegetation is luxuriant and subtropical, but a large percentage of the soil is lost to agriculture, because of inability to conserve water for irrigation. Evaporation is excessive, and dams conserving locomotive water supplies are only located across deep and narrow gulches.

Built gradually inland by tortuous routes through the mountain passes from the coast ports of Capetown, Port Elizabeth, Durban, and, in Portuguese territory, Lorenco Marques, four separate lines of railway, since 1873, have been extended, branched and finally connected in the vicinity of the gold mines of Johannesburg. Most of these railway extensions were made in advance of the settlement of the districts they traverse. They have enjoyed almost from their inception the financial potency of government ownership and control. They were built on a permanent basis, even though they were development lines. The number of wooden bridges on the South African railways today may probably be counted on the fingers of one hand. Even water openings as small as 6 and 9 ft. across were originally spanned by plate girders on masonry abutments. Owing to the ravages of wood devouring ants and to the difficulty of obtaining native timber fence posts, telegraph poles and, to a certain extent, cross-ties are made of iron and steel. Old rails play an important part in maintenance repairs, being used as posts and girders in buildings, and in concrete as reinforcement.

The capital expenditure on these railways at the end of 1910 was approximately $380,000,000. The general manager of railways and harbors in his report for that year voiced the governmental policy in part as follows:

"The development of the natural resources of a large area of this vast territory, equal to nearly four times the size of the United Kingdom, is as yet only in the early stages, and, in the interests of the country generally, it is incumbent upon the administration to pursue the policy best suited to aid expansion. . . . South Africa has now become a producer of almost every product necessary for its sustenance, although not yet to such an extent as to make it self-supporting. South Africa differs from most other countries. Its natural means of production require the aid of science to promote development in the initial stages. The presence of great mineral wealth and the markets opened up thereby should, however, provide the resources required, and compensate for the greater natural advantages of other countries."

REVENUES DERIVED BY GOVERNMENT FROM RAILWAYS.

As a matter of fact, the railways have for years been important sources of revenue to the colonial governments. In 1910 the net income of the railways of the Union amounted to an equivalent of $26,500,000, or over 45.5 per cent. of the gross earnings. Nor was this an abnormal year. It must be understood that a large percentage of the freight and passenger traffic is through business. Passenger rates are three times as great as the 2 cent fares of the United States. Freight rates are comparatively even higher than passenger fares. There is no competition except as between the different coast terminals of the system itself. On the other hand, these results are obtained in spite of narrow gage tracks, climbing grades as steep as 3 per cent. around curves as sharp as 20 deg. on the mountain divisions. Locomotive water of acceptable quality and in sufficient quantity is the reverse of plentiful and water softening plants have in some cases been installed.

The equipment of these railways includes 1,450 locomotives, many of American manufacture, and a few of the Mallet compound type; 2,072 passenger coaches and 2,300 freight cars. Approximately $225,000 is annually expended on purchase and repair of tarpaulins used for covering freight loaded in gondola cars. Only 10 per cent. of the freight cars are enclosed. Even stock is transported in high sided gondola cars covered with netting of light rope. The passenger coaches compare favorably with the equipment of the best railways of Europe. South African trains de luxe are all that the name implies, even to compartment sleepers, observation cars and shower baths.

These railways have some 50,000 employees, of whom 26,500 are white, the remainder being Hindus and negroes of the vari-

ous African tribes. The section laborers are almost all negroes, while a large percentage of the foremen are half breeds or negroes. A pension system to which the employees contribute monthly is successfully maintained and self-supporting. It is in fact, a civil service, to which belong regular employees of the railway and other governmental departments, as the public works and post office departments.

The railways obtain a net annual revenue of $110,000 from the catering department, the gross earnings of which are $1,300,000. In addition to the dining car service this department includes railway restaurants, hotels and bars at many of the principal stations and terminals.

All railway news stands are likewise owned and operated to advantage by the Department of Publicity. This department carries on the usual railway advertising, controls the leasing of advertising rights on railway property and goes extensively into photography as a means of educating the world at large as to the products and scenery of South Africa, the opportunities for the immigrant and the traveler.

We note in this connection that "In conjunction with the various municipalities the publicity branch will also, as opportunity offers, thoroughly bioscope South African scenery and industries. The films will be sent to England and sold to bioscope distributing firms."

Betterment work has been steadily proceeded with year by year as on American railways. Surveys for diversions and reductions of grades were under way on a large scale in Cape Colony and the Transvaal in 1903, since which time many extensive betterments in alinement have been carried out. Bridges have been strengthened or replaced to allow of the purchase of heavier equipment, and new track with 80-lb. rail, tie plates and new ties has been laid on the western and other lines of the system. The most thorough renewals have been made within the past two years between Capetown and the Kimberley diamond mines.

COST OF CONSTRUCTION.

Measured by American standards South Africa railway construction is expensive and maintenance is cheap. These conditions are partially the result of cheap unskilled labor, of expensive skilled labor and of the expense of importing machinery; but cheap cost of maintenance is a natural result of exceptionally well-constructed, well-drained roadbed, permanent bridges and good track. The idea that developing lines must be cheap in first cost has been proved wrong through all the years of experience in railway building, but American capital seems never to have learned the lesson. The estimated cost of 526 miles of single line built by the Union in 1911 averaged $23,000 per mile. In this estimate the cost of grading looms very large. Nearly all of the actual construction of the earthworks is performed by negro labor with pick, shovel and wheelbarrow at a wage of scarcely $1.00 per day. South African railway contracts are most often let to large contracting firms, who obligate themselves to turn over the railway complete, for a certain lump sum, after the government has for a certain length of time operated over the track on approval. Such a bargain is usually made only after exhaustive examination by the bidders of soundings for bridges and excavations. The bid is based on the government engineers' approximate estimates made from the located lines and contour maps, which are most exact. All items appearing on these maps and profiles are considered as within the scope of the lump sum bid. All others are extra and are paid for by the force account method. The vexatious questions of classification of materials and overhaul are thus eliminated, while the location and construction of buildings, water tanks, station grounds and side tracks, fences, crossings and cattle guards are worked out in advance of construction and included in the contract.

The rails used are of European and American manufacture; the American rail being easier to procure on short notice, while the English rail is favored as better wearing in addition to being a "home" product. The cross ties in use on these railways are of hardwood and pressed steel. The pressed steel inverted trough "sleeper" has not proved economical. It makes bad track when mixed with wooden ties. Derailments are disastrous to the section of steel ties. Once they are bent, it is very difficult to repair and regage them. Cinders and moisture cause them to rust and deteriorate rapidly.

Steel trough sleepers are most in favor in dry desert districts where the loose sand will not pack under wooden ties and where the white ants make short work of wood fiber. Here the inverted trough sleeper confines the sand under its surface where it solidifies or cakes. In such regions track surfacing is done only during rainy weather. The wooden ties in use on the Union railways are the D'jatti from Java, the Jarrah and Eucalyptus from Australia, and the yellow wood of the Knysna forest of Cape Colony. Here the government operates a creosoting factory.

Nine railway tie plantations are maintained by these government railways, where are grown trees of the different varieties of Eucalyptus, pine, cedar and cypress. Of the nine forest farms under cultivation eight are in the colony of the Cape of Good Hope and one is in the Transvaal. The total acreage in trees is 7,341, while nearly 30,000 acres in all are reserved for this purpose.

The use of concrete is very general for bridge piers and abutments, culverts and foundations of all descriptions. Corrugated, galvanized iron is very largely used for roofing, fencing and siding. Water tanks are of 4 ft. sq., cast iron plates framed and calked, imported knocked down from England. Brick and concrete are the usual building materials. Many government buildings have roofs of slate or tile.

PROVISION FOR GOOD OF EMPLOYEES.

The government railways house most of their employees and officers at nominal rentals in comfortable quarters, and further assist them by transporting free of charge all goods ordered from railway co-operative or government contractors' stores, at 10 per cent. less than retail prices at coast ports. These supplies accompany the monthly pay trains, and payment therefor is deducted from monthly wage disbursements.

Schools are built, furnished and maintained for the education of the children of the railway employees. Railway physicians are stationed at convenient points, and free dispensaries are at the disposal of the families of the railway staff, as well as the services of the railway surgeon who has a private hospital car in which he makes regular trips over his district to treat those who cannot come to him.

Railway missions have been established and missionaries have coaches where necessary to hold services at way stations where other quarters are not available.

In short, the management of these railways meets the needs of the country, and anticipates and provides for the wants and comforts of its employees and their families. The lines, so curious to the American mind in many ways, have been, and are the great civilizers of South Africa. In this land of perfect climate, of wonderful flora and more wonderful mines, of savage peoples and arid plains, of luxuriant valleys and sterile mountains, the same problems of civilization and progress are being solved as in our own country, largely by means of representative systems of rapid transit, chief among which is the steam railway.

PROPOSED RAILROAD IMPROVEMENTS IN BELGIAN CONGO.—The main artery of trade between Congo seaports and not only the upper Belgian Congo, but the French Congo as well, is the Lower Congo railroad from Matadi to Leopoldville, 250 miles. Recently this road has somewhat reduced its freight tariffs. The double-tracking of this line is still under consideration as a possibility, as is the reduction of its curves and grades, and the widening of its gage. The problem of its electrification has recently been studied.—*Mining and Scientific Press.*

CAR WHEELS.

At the meeting of the New England Railroad Club on Tuesday evening, May 13, two papers were presented—one on cast iron wheels by A. A. Hale, of the Griffin Wheel Company, and the other on steel wheels by M. D. Hayes, of the Midvale Steel Company.

Mr. Hale first reviewed the history of the development of the cast iron wheel and then took up its physical properties. He presented a chart showing that the coefficient of friction between the chilled iron wheel and the brake shoe, whether the latter was of the insert type or plain cast iron, was about 20 per cent. more than with the steel wheel, and stated that a great many types of brake shoes which are used on chilled iron wheels cannot be used on steel wheels because of the injury to the tread; therefore, plain shoes having a lower coefficient of friction are essential to steel wheel service; and further the comparative metal worn from brake shoes under like conditions indicates that the life of the shoes is increased from 20 to 25 per cent. where chilled iron wheels are used—a statement that is also borne out by laboratory work.

The real service performed by a wheel is the amount of work that it does. Available data shows that in freight service the performance of the chilled wheel will approximate 375,000 ton miles per wheel, for ⅜ in. radial wear. Based on a life of from 10 to 12 years and an average mileage of 26 miles per day, it was estimated that the average mileage of a chilled wheel under freight equipment in the United States was from 100,000 to 110,000 miles. Under the present guarantees of 6 years for a 625-lb. wheel, 5 years for a 675-lb. and 4 years for a 725-lb., under cars of 60,000, 80,000 and 100,000 lbs. capacity, respectively, the average chilled iron wheel costs the railroad company 29 cents per year, or $2.32 per car, and the wheel records of the leading railroads of the United States show that 97 per cent. of all freight cars, including 100,000 lbs. capacity cars, are equipped with chilled iron wheels, and, on this basis, it was estimated that there are 2,219,563 chilled iron wheels in use, whose first cost was about $167,600,000.

The trouble is that excessive work is demanded from wheels in proportion to their increase in work as compared with other parts of the running gear, and yet, with nearly 700,000 wheels under 100,000 lbs. capacity cars, replacements have amounted to but 0.9 per cent., and most of these wheels weigh but 700 lbs. They are also being extensively used in passenger service, and by actual count, during a day in the Chicago terminals, out of 49,500 wheels entering there were 15,992 of cast iron.

During the past three years a number of special types of cast wheels have been marketed and they have been widely adopted for both passenger and freight service.

As for carrying capacity, special chilled wheels 33 in. in diameter and weighing 925 lbs. have been placed under engine tenders having a capacity of 9,500 gallons of water and 16 tons of coal, each wheel carrying 27,000 lbs., or a total load of 216,000 lbs. Wheels of the same diameter weighing 840 lbs. are in use under ore cars of 60 tons capacity, operating in a mountainous district, and are working satisfactorily. In fact, chilled iron is the only metal which will stand up under extremely heavy loads without flowing.

The causes for which wheels are removed depend largely on the care which is given them, so that the defects which cause sharp flanges, flat spots, brake burns, etc., can be practically eliminated if sufficient forethought is given to the subject.

Take sharp flanges, for example. One of the first essentials to the prevention of worn flanges is to have wheels of the same circumference mounted on the same axle, also the trucks should be in proper alinement. If a flat spot is formed on a chilled wheel it sounds a warning that attention is needed. In the case of the steel wheel the large flat spots are often rolled out so that the noise is eliminated, but the wheel remains out of round, and there is an increasing burden put on the track and rolling stock.

Like the flat spot, the shelled out spot is caused by skidding. The high temperature thus produced causes a violent local expansion and almost as rapid a contraction, while the balance of the wheel is cool, and this causes the metal to become disintegrated and tear apart, after which the blows which are received in subsequent service cause small pieces to drop out of the surface which has been so weakened, and it takes only a short time for the typical shell-out to appear. If the wheel were examined immediately after skidding took place, the fine network of hair lines could be easily detected.

It would seem that both wheels on an axle should be equally affected, but this need not be the case, because of the sometimes uneven distribution of the load. In brake-burned wheels the tread is broken up in fine hair lines running parallel to each other across the tread. They are developed in greatest numbe s in freight service in sections where the grades are most frequent and severe.

Mr. Hayes divided his paper on the steel wheel into two parts, the steel tired and solid steel wheel. He gave a general description of the several types of steel tired wheels which are and have been made, and entered in some detail into the methods of rolling tires.

As for the rolled steel wheel there are four manufacturers now in the market, each producing essentially the same article, but by quite different methods. For example, No. 1 casts a long rectilinear ingot, rolls it into a round bloom, cuts it into short cylinders and then presses and rolls the wheel. No. 2 casts a small conical ingot and presses and rolls this direct into the wheel. No. 3 casts a long cylindrical ingot, cuts it cold, in a lathe into short cylinders and then presses and rolls it. No. 4 casts a long rectilinear ingot, rolls it into a flat slab, cuts square blanks from the slab and then presses out the wheel. The average properties of the rolled steel wheel may be taken, as thus made, as:

CHEMICAL PROPERTIES.

Carbon	.68 to .85
Manganese	.60 to .65
Silicon	.15 to .30
Phosphorus, not to exceed	.06
Sulphur, not to exceed	.05

PHYSICAL PROPERTIES.

Tensile strength	125,000 lbs.
Elastic limit	72,000 lbs.
Extension	10 per cent.
Contraction	15 per cent.

Thus the solid steel wheel has the same high qualities as the steel tire.

The method of fabrication used by the Midvale Steel Company is to pour cylindrical ingots from the bottom. These ingots are about 6 ft. long and 20 in. in diameter. They are poured in groups of four from a common riser. After cooling, they are stripped and cut into short cylinders in a lathe, two tools being used entering from opposite sides. They are not cut quite off, but a central portion about 3 in. diameter is left. This is broken and its fracture serves to indicate in a way, the quality of the metal. The top cylinder only, which is about 15 per cent. of the ingot, is discarded and a wheel is made from each of the other sections. Any segregation that may have occurred on the center line of the ingot is punched out in the forming of the wheel seat in the hub.

This section of the ingot is first heated and then subjected to two pressing operations, in which an embryo of a hub and flange is formed. It is then reheated and rolled. Two driving rolls grip it on the web and roll it out, increasing the diameter of the piece until the wheel is formed, a back roll bearing against the outer edge meanwhile to form the tread and flange.

The discussion turned to a great extent on brake shoe action. On this there is comparatively little information, but it appears that the same brake shoe when applied on steel wheels shows a greater wear than when applied on chilled wheels, but as for the effect on the wheels it is almost impossible to segregate the wear of wheels due to operating conditions from the wear by the brake shoe, and yet in a laboratory steel wheel on which more than 10,000 brake applications have been made, varying

from 3,000 to 20,000 lbs. in pressure, there is no appreciable wear.

The importance of keeping brake rigging in good condition was emphasized and attention was called to the great injury that could come to wheels where the hangers were at improper angles.

One speaker in calling attention to the good work that had been done in the past by the cast iron wheel, expressed the belief, though he had no data to substantiate it, that from a metallurgical standpoint the cast iron wheel improved by use. That is to say, the jar and vibration to which it was subjected tended to permit the molecules of the metal to readjust themselves, and thus relieve the initial internal stresses to which the metal was subjected.

THE SIGNAL DEPARTMENT.*

"Jim Cheevers," the bright creation of the editor of *Locomotive Engineering*, was made foreman of a small outlying railroad shop, and found the machinery being run by an unnecessarily large slow speed engine, discarded from the big shops elsewhere, and noticed that a much used path from the yard outside to the enginehouse was through the engine-room; and that a man who had been, on entering, in somewhat of a hurry, which was rare, generally was slowed down as he emerged from the engine-room on the other side. After some study and a campaign of correspondence with the master mechanic, he obtained a small high speed engine and substituted it for the big slow speed type. In a few days Jim was pleased to note a material change in his small force by a quickening of the men's gait, particularly upon passing through the engine-room.

So it is with signals. The present day checking which enforces proper respect for certain of the operating rules is such as to brace up the entire train movement. No longer, without others knowing, can the zealous local freight crew, anxious for a record, make one more last switch on the main track in advance of an approaching superior train. No longer can the inferior train make a too close run for a meeting point. On the other hand, a train, instead of taking siding upon some arbitrary order of the despatcher to wait ten, twenty, and perhaps thirty minutes for a following train to pass, rather can, on signal track, run until, as passing out of any block, the signal seen behind standing at stop marks the entrance of the following train into block limits in the rear, and gives notice to clear the main track at the next siding, with a total delay possibly of not more than five or ten minutes. A train entering a clear block proceeds with certainty at a maximum speed even though it may know that it is following another quite closely. The increase in capacity of a road is due largely to the possible increase in number of trains which may pass a given point in a given time, particularly in those periods of "bunching" which are so apt to occur.

In Tennessee, a heavy single track operating division of 150 miles required three sets of despatchers. The signal engineer designed and installed a controlled manual signal system to give superiority to trains "over the mountain" a distance of nine miles. The number of train orders was reduced thereby 34 per cent. and one set of train despatchers withdrawn.

At a certain junction of single and double track, it is necessary for orders to be put out for all trains in one direction, requiring very close application to the key by the telegraph operator, and a second man is continuously required to handle the interlocking machine. The installation of a system providing for handling trains by signals to the next telegraph office on single track, allows the transfer of most of the orders to this latter station, relieving the first station to such an extent that, for each twenty-four hours, two of the three extra men on the switches are eliminated, with a monthly saving of $110 by an original outlay of $1,500 and a merely nominal increase in monthly expense.

*Extracts from a paper read before the Central Railway Club, Buffalo, N. Y., May 9, by B. H. Mann, signal engineer of the Missouri Pacific, and president of the Railway Signal Association.

A good signal repairman may make up in moulds the concrete foundation blocks and put on them a good smooth surface. He may make a pretty fair looking bend or offset in a piece of 1¼ in. round steel and put up a smooth even weld in that cross-section of metal. He may cut and thread 1 in. gas pipe and measure and punch the rivet holes for the lengths so as to accurately fit up the connecting line. He may adjust a compensator so as to properly take up the variation due to temperature change. He may either sharpen a chisel or temper it, or grind a twist drill and lay out and drill a set of holes in a steel tie plate so that the track shall remain correctly at gage. He may either file and set a saw and cut a fair miter in lumber for wire trunking, or renew a leather on the piston of an air valve and pack a stuffing box. He knows the sort of lubrication to apply to a mechanical locking bed and to a switch movement, to an air cylinder and to a gasoline engine. He can test out a simple electrical circuit and repair the fault, renew the wire trunking lumber, either over or underground, and apply the pitch, when necessary. He must intelligently handle the expensive 30 per cent. rubber compound wire and properly make and insulate a splice, or may have occasion to do linemen's work and must be able to use the spurs to climb a pole. He may either set a pole, apply a cross-arm to the pole, put on the braces, pins and glasses, tie the wire to the glass, or do odd jobs of painting. If every fifteen mile section of road does not have a man who can do either or all of the things required, it means that a man must travel from some neighboring section to do the required work.

Except the traffic be very dense and fast, a repairman can reach any part of a fifteen mile district in about an hour, by velocipede or motor car. Being on the spot quickly after an accident is of great advantage both as to prevention of unnecessary damage to apparatus and as to check on the working conditions. Modern interlocking plants with their simple checks and counterchecks, such as the facing point lock, the bolt lock, the mechanical locking and the time lock, are about as near foolproof, when rightly maintained, as it is possible to make them. I speak of this for the reason that in every new art there comes a time when there is, through ignorance, a suspicion of some unknown failing against which a man cannot protect himself.

On a lightly signaled division, the repair force may spend as much as six hours in travel for every hour of work. Where this is the case, there is an incentive to provide other duties for the signal force, so as to reduce, to as great an extent as practicable, the waste time on the road. In one case this was done by assigning to the signal men all miscellaneous blacksmith work on the division, all light repairs such as window glass setting, and odd painting. A crew of three men under this assignment would regularly start at one end of the division, and, moving forward a few miles daily, would keep up all light repairs on track tools, switches, switch stands, frogs, crossings, buildings and signals, with but very little time spent in travel.

Speed of Locomotives in 1832.—Extract from a report of John Randel, Esq., engineer in chief of the New Castle and Frenchtown Railroad Company, to the board of directors, dated New Castle, July 4, 1832, relative to the performance of the locomotive "Delaware." This engine is one of Stephenson's make, with Booth's patent boiler, and the performance detailed is the first effort made with her. "Yesterday and today I made a trial of this engine between this place and Frenchtown, and have the satisfaction of being able to say that it worked well. The large radii of our curves (the least being 10,000 ft.) will enable us to pass through them without abating its velocity. In going yesterday to Frenchtown we passed through the fifth curve (radius 20,000 ft.) with a velocity of 15 miles an hour. Returning to New Castle we passed through it with a velocity of upwards of 20 miles per hour."—*Extract from the National Gazette, published in the American Railroad Journal of July* 14, 1832.

Maintenance of Way Section.

THE recommendations adopted by the Safety Committee of the Chicago & North Western, which appear in another column in this issue, may impress some as enjoining conduct the desirability of which is self-evident, but it is accidents that result from failing to do what is obviously the right thing to do that are most numerous. If employees can be impressed with the inadvisability of doing things in a way which they know involves risk, or "taking a chance," a large proportion of the accidents will be eliminated. The fact that conditions giving rise to these recommendations have been found to exist on a road with the standards of maintenance of the North Western is a strong indication that these same conditions can be found on many other roads.

IN our issue of November 15, 1912, we described a method used on the Pittsburgh & Lake Erie to equate the work on various track sections as a basis for allotting labor forces for these sections. In this issue E. R. Lewis describes a similar method used on another line and gives the values assigned to the principal items of maintenance work on one large division. These studies are particularly encouraging as showing the attention which is being paid on certain roads to the economic supervision of expenditures for maintenance of way and their distribution to secure the best results. They are especially instructive in view of the general practice of distributing forces arbitrarily to the various sections, and allotting the same number of men to each gang, regardless of the local conditions on the different sections. A study of actual performances and of local conditions is essential to a proper distribution of forces. As Mr. Lewis says, "No employer of labor can accurately distribute his laborers until he knows how much work each one has to do."

WHILE the suggestion made in another column that 6 ft. is a sufficient length for a guard rail will undoubtedly appear radical to many men, this length is nevertheless in line with the trend in guard rail development. Two general conditions govern the length of a guard rail, first (and most important), the service required, and second, the economical use of material. It is for the latter reason that 15 ft. and 16 ft. 6 in. guard rails are commonly used now, one rail thus making two guard rails. With reference to the service required from a guard rail, it is not many years since it was considered necessary that it should be at least 18 or 20 ft. long to properly guide wheels past the point of a frog and to have sufficient rigidity to remain in its proper position. The recent tendency has been materially to reduce the length of the guard rail, as it has been felt that the shorter rails carry the wheels past the point of a frog as safely as the longer rails, the protection opposite the frog being exactly the same, and less material is required. With the modern spacing blocks and rail braces, the short rail can also be held in its correct position as rigidly as the longer rail with its old fastenings could be held a few years ago.

A CLAUSE in a contract recently executed between a railway and a boarding camp contractor stipulating that no meals shall be furnished free to employees of the railway calls attention to a minor but very common abuse. On many roads it is customary for the officers and engineers to stop at the nearest camp for dinner, and it is generally understood that no payments for their meals is expected. In many instances such a camp is the only accessible place to eat and the engineer can also frequently discuss details of the work with the contractor and foremen at this time. The objectionable feature is not in eating at the contractor's camp, but in failing to pay for it—which practice really degenerates into a petty form of graft. Another objectionable practice of a similar nature which is found on many roads and sometimes even specified in the contracts, is the provision for free board and lodging for the foreman. As practically the entire income of a boarding contractor is derived from the payments of the men for board, the laborers in the gang are thus in reality paying the foremen's board, although less able to pay it than the foremen. The placing of the boarding concession on this road upon a sound business basis, where every employee pays for what he gets, is simply applied common sense and common honesty, and its influence upon all concerned should be beneficial, showing, as it does, the attitude of the company towards the various forms of petty graft and irregularity.

THE importance attached to a systematic inspection of frogs and switches varies widely on different roads. On some the engineer maintenance of way or the division engineer personally inspects all main line switches with the supervisors and foremen, noting their condition, giving directions regarding their maintenance and advising regarding repairs or renewals. On others no such inspection is made, the maintenance of switches being left to the supervisors, and in some instances almost entirely to the foremen. This latter practice does not seem consistent with the attention paid to other details of maintenance. Every switch in a main track is a source of weakness and danger, even though small, and therefore precautions to insure the highest standard of maintenance of turnouts are important. The number of accidents resulting from broken or worn switch parts is far from negligible, and in not a few cases the defects giving rise to them would have been discovered by proper inspection. The increasing number of derailments due to worn switch points, especially in combination with worn wheel flanges, has been the cause of considerable concern on a number of roads recently. The action of the American Railway Engineering Association in assigning to one of its committees the study of the relation between worn flanges and worn switch points with a view to decreasing the number of derailments due to them should result beneficially. At the same time it emphasizes the importance of the entire subject of switch maintenance.

THE practice as to setting ballast stakes preparatory to ballasting old tracks varies widely on different roads, and on different divisions of the same roads. In many cases stakes are carefully set before the ballast is unloaded, and the track is then raised to the stakes. In other cases the practice is to raise the track a uniform amount depending on the quantity of ballast unloaded and the judgment of the foreman, without reference to stakes. While extensively followed, this latter practice is open to several objections. The grade line of an old track tends to depart considerably from that originally laid out owing to settlement of banks and other natural conditions. Again, if left to himself, the average track man will raise his track on all occasions, when in fact many times he should dig down to avoid disturbing the grade line. Also rather than compensating each other, successive raises of ballast nearly always tend to aggravate these discrepancies. If these conditions are allowed to continue through successive ballasting, the variations between the actual and theoretical grade lines, while short and perhaps unimportant in themselves, may be sufficient to interfere seriously with tonnage trains and may ultimately result in a reduction in tonnage. On an undulating grade below the maximum these variations may be unimportant, but if on the maximum grade they assume considerable importance. It is very common to find upon theoretical ruling grades of .5 per cent., short stretches of 1 per cent. or even higher grades, due to these causes. Another point which should be considered in setting ballast stakes is that of adapting the raise to the amount of ballast required. With a uniform raise the high points are lifted with the low, although in most

cases the fact that they remain high indicates that less ballast is actually required. If properly set ballast stakes should not only remove many of the minor irregularities in grade, but should also adapt the raise to the needs of the track, in this way conserving the ballast. An inch of ballast saved per mile will pay the cost of setting the stakes several times. Either the maintaining of a uniform grade line or the saving of ballast should be sufficiently important to justify the setting of grade stakes, for the cost of setting these stakes is almost negligible as compared with the amount expended in ballasting.

PROBABLY the most conspicuous inconsistency existing in maintenance work lies in the manner in which ties are handled after being treated with preservatives. The treatment of ties has become so general that a discussion of its merits at this time is superfluous, even though it may add from 10 to 25 cents to the cost of the tie. But precautions to protect the tie frequently end at the treating plant. After it has been left the ties are handled in the same way as previously. One still frequently sees section forces dragging them into place with picks which have been driven into the wood until they have penetrated almost, if not entirely, through the treated portion, giving the moisture direct access to the unprotected timber. Although not as prevalent as formerly, this practice is still followed on a number of roads in spite of the fact that tie tongs can be purchased at a nominal cost, or can be made at the company shops. A cause of much more serious damage is the adzing of ties after treatment. While the adzing of hewn ties is usually necessary to provide a full bearing for the rail, this can be done before treatment as well as after. Not only is the load on the tie concentrated under the rail, but moisture itself is retained here longer than on exposed portions of the tie. Under these conditions nothing can tend to decrease the life of the tie to a greater extent than to remove part of the protected coating on this heavily loaded portion. A beam designed to perform the work of a tie would be especially strengthened at the point of application of the loads, but on the contrary, the resistance of the tie is usually decreased at this point. The adzing of ties before treatment would appear to be consistent with the practice of treating itself, and it is becoming more generally adopted as it is brought to the attention of railway men. It is entirely probable that the thorough preparation of the ties before treatment to reduce the mutilation after treatment to the minimum, will become the general practice before many years.

OPPORTUNITIES FOR MAINTENANCE MEN.

THE comment is frequently heard from engineers and supervisors that there is little opportunity for advancement for officers in the maintenance of way department, the line of promotion being confined closely to those coming up through the operating department. This situation is true on many roads, but is far from universally true. A brief study of the Biographical Directory of Railway Officials just issued, shows that out of 35 presidents of prominent roads selected at random, six came up through the maintenance department, while the number of operating vice-presidents who came up through the same channel is considerably larger. Among the presidents may be mentioned L. F. Loree, of the Delaware & Hudson, who advanced through the engineering department to general manager of the Pennsylvania Lines West; Samuel Rea, of the Pennsylvania, who rose through the engineering department of this road as did his predecessors, James McCrea and A. J. Cassatt; H. U. Mudge, of the Rock Island, who advanced from section hand to the positions of roadmaster and superintendent; S. M. Felton, of the Chicago Great Western, who started as an engineer on the Pennsylvania; B. F. Bush, of the Missouri Pacific, who advanced through the engineering department, and W. J. Harahan, of the Seaboard Air Line, who was roadmaster, engineer of maintenance of way and chief engineer. Among the operating vice-presidents may be mentioned E. J. Pearson, of the Missouri Pacific; A. T. Hardin, of the New York Central & Hudson River; W. B. Storey, Jr., of the Atchison, Topeka & Santa Fe; George T. Slade, of the Northern Pacific, and A. W. Thompson, of the Baltimore & Ohio. These lists might be lengthened by mention of many other prominent railway men, such as J. Kruttschnitt, chairman of the Southern Pacific. The recent increase in the appointments of engineering and maintenance of way officers to prominent executive positions, including W. J. Harahan, of the Seaboard Air Line; A .T. Hardin, of the New York Central; E. P. Bracken, general manager of the Burlington, as well as the promotion of others to superintendents and similar positions, should be a source of gratification to maintenance men. When the demand is for men who can handle men, and at the same time have a knowledge of the value of labor and materials, it would seem that the maintenance man should be well qualified for promotion, and the increase in the number of them who are being promoted indicates that this fact is constantly becoming better appreciated.

SYSTEMATIC TRAINING OF FOREMEN.

IT is a universal complaint that we do not have the same quality of track foremen we had a few years ago and that they are not capable of doing any work which may be assigned to them outside of their routine duties. It must be admitted that this is to a large measure true. Many track supervisors have only one or two foremen upon whom they can rely properly to lay a switch in a main line. Bridge supervisors likewise complain that they can trust but few of their foremen to operate a pile driver or to build falsework under a main track. This is largely due to two conditions. In the first place, the larger maintenance organizations naturally cause a greater tendency towards specialization, with the result that less attention is paid by the supervisors to instructing the foremen with regard to other than the duties immediately before them. Secondly, with the more permanent nature of the present roadbed and bridge construction, the frequency of emergencies requiring wide experience is less than formerly. It is natural that a man who becomes efficient in any one kind of work should be kept at this and each man should be encouraged to become a specialist in some one line. However, men should seldom be allowed to specialize in one line of work to the exclusion of other lines, for the time is very apt to come when they will be called on to handle other duties. Few things are more disheartening to a construction superintendent than to attempt to carry on track changes or other work of similar nature with foremen who have never done other than routine maintenance work. Their attempts to cut, throw and connect up track in a limited time between trains would often be amusing but for the seriousness of the matter. A versatile foreman is not only valuable in such emergencies as the recent floods, but also in many smaller local emergencies which are encountered from time to time. It is largely because of his versatility and wide knowledge of various problems that the "hobo" is an efficient laborer, and it is not unusual for a "hobo" to be more adept in handling a certain problem than the foreman himself. If the supervisor in any department will make it a point to instruct his foreman regarding the more special problems as opportunity offers and give them an opportunity to handle special work from time to time, he will soon develop a set of men whom he can rely on to handle any class of work he may suddenly desire to call upon them for and greatly widen the field of their usefulness as well as lessen his trials. The gradual narrowing of the range of activities of the foremen is not due entirely to a decrease in the ability of these men, for they themselves are victims of the larger and more specialized organizations built up by the supervisors. The need of personal attention and instruction of the foremen by the supervisor is becoming increasingly important from year to year because of the changing conditions under which they work.

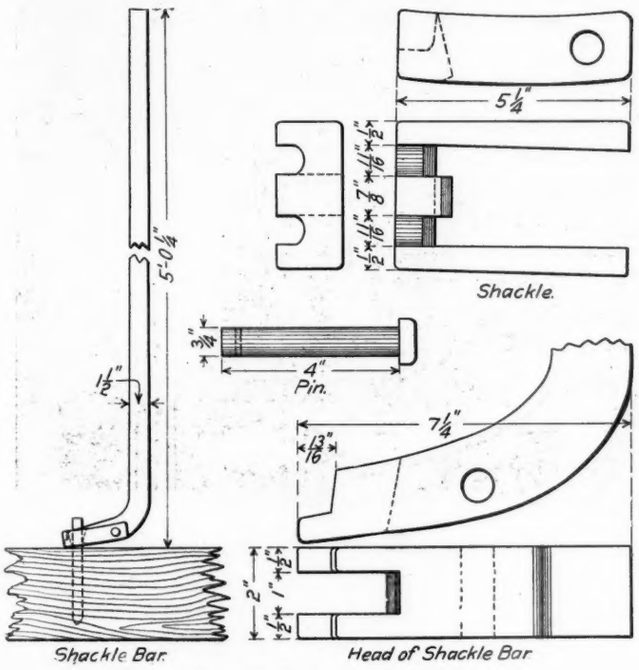
Letters to the Editor.

A SHACKLE BAR.

St. Augustine, Fla., March 10, 1913.

To the Editor of the Railway Age Gazette:

In the issue of the *Railway Age Gazette* for February 21, 1913, there was an article entitled, "A Bolt Puller," by H. C. Swartz, master of bridges and buildings of the Grand Trunk, St. Thomas, Ont. The accompanying blue print shows a similar device which has been used on the Florida East Coast for a number of years. This device is the result of many years



Shackle Bar and Details.

experience and development, and is shown herewith in its final form. While at first glance it would appear to be more complicated than the bar described by Mr. Swartz, it has stood the test of time and is so constructed that it will pull either round or square bolts or drifts of any size commonly used. We make these bars in our own shops and find them very useful and reliable.

A. H. Stead,
Assistant Engineer, Florida East Coast.

INSPECTION BY AUTOMOBILE.

Chicago, May 5, 1913.

To the Editor of the Railway Age Gazette:

With reference to the article published in your issue of December 20, on the cost of automobiles for inspection, the following data on their employment during the construction of the Southern New England Railway may be of interest. In the execution of this work, automobiles were found to be not only desirable but absolutely necessary both for the engineering force employed by the railroad and for the contractors. In this connection, it is interesting to note that the contractors in making claims for the rent of idle plant, present bills to the railway company for their automobiles the same as for steam shovels, boilers, steam drills, derricks and other equipment.

During the construction of the line between Palmer, Mass., and Providence, R. I., the officers of the Southern New England used two machines, one being a seven passenger Alco, and the other a five passenger R-C-H. The contractors used five machines, including two seven passenger Pierce-Arrows, one seven passenger Locomobile, one seven passenger Palmer-Singer, and one Buick runabout. This equipment, however, was found to be inadequate, and additional machines were frequently hired.

The cost of the R-C-H machine used by the engineering department of the railway for a service of about 5,000 miles between September 1, 1912, and March 1, 1913, amounted to $308.73, covering gasolene, oil, tires, repairs and garage charges. This is at the rate of a little less than 6.2 cents per mile. When it is considered that the machines usually carry from four to five passengers, the economy for the service is self-evident. The railway company, however, charges off $600 for depreciation on the machine originally valued at $950. This charge is undoubtedly too heavy, as $300 would probably be sufficient, but accepting figures as they are, they show the total cost of operation of 18 cents per mile.

The advantage of the machines in making trips where frequent short stops are necessary for inspection purposes is clearly indicated in the accompanying table covering a trip from Palmer to Providence in July, 1912:

		Traveling Time.
Leave Power House (1 mile from Palmer)	5:00 A. M.	
Arrive West Brimfield Trestle	5:07	:07
Leave West Brimfield Trestle	5:16	
Arrive Worcester	6:40	1:24
Leave Worcester	6:51	
Arrive Uxbridge	7:48	:57
Arrive Millville	8:00	:12
Arrive Woonsocket	8:16	:16
Leave Wocnsocket	9:00	
Arrive Providence Depot	10:00	1:00
Total time traveling		3:56
Dead time		1:04
Total time		5:00

As the distance is about 80 miles, this record shows an average speed of 20.34 miles per hour. No trouble of any kind was experienced with the machine. On another trip the run straight through from Palmer to Providence was made in 3 hours and 37 minutes. On this occasion a seven passenger Packard was employed. The same distance is covered by train on the New York, New Haven & Hartford in 3 hours and 6 minutes.

H. C. Estep.

GRAND TRUNK STAFF MEETING.

The first of a series of staff meetings which are intended to be held periodically for the discussion of technical, practical and accounting features connected with railway construction, maintenance and operation on the Grand Trunk, was held in Toronto on April 19. This meeting was largely attended by the higher officers of the construction, maintenance and operating departments with their chief assistants, division officers and other assistants. The purpose of these meetings is to discuss improved methods, standard practice, economics of construction and maintenance, etc. At this first meeting revised standard specifications covering various classes of work, together with standard forms for reports and accounting in connection with such work, were discussed and adopted, and will go into effect at once. This meeting was presided over by H. R. Safford, chief engineer, although the discussions were entirely informal and position and rank were disregarded.

Among the benefits outlined by Mr. Safford in opening the meeting, were; first: those arising from the personal acquaintance of a large and widely scattered organization; second: increased co-operation between various portions of the same department and between different departments; four departments being represented at this conference. The frequency of these meeetings has not been determined, but it is believed that conferences of this nature will not only insure greater standardization and economy of work, but also the formulation of better standards due to the opportunity for a free exchange of ideas.

SANTA FE ROUNDHOUSE AT RIVERBANK, CAL.

The Unit System of Concrete Construction Was Adopted in This Structure. Details of the Design, Casting and Erection.

The Atchison, Topeka & Santa Fe has recently built at Riverbank, Cal., a 90-ft., 15-stall roundhouse entirely of reinforced concrete, where the concrete was cast on the ground in wooden molds arranged in a casting yard adjoining the building site, instead of being poured in place. The reinforcing steel was locked in place in these molds, which were carefully inspected before concrete was placed. After the concrete had set, the members or "units" were lifted from the molds by a crane and set in the building much as if they had been of structural steel. The molds or forms were made with great care, and considerable attention was given to the details and finish, the result being a particularly smooth and attractive concrete surface. The wall slabs were cast flat and the exposed face finished to a fine granulated surface with a cork float.

Fig. 1—Roundhouse Site Showing Foundations and Slab Yard.

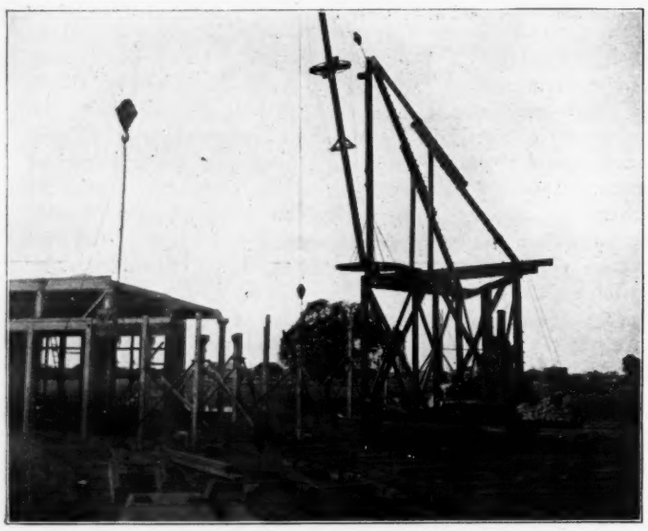


Fig. 2—Stiff Leg Derrick for Erecting Units of Roundhouse.

The forms were bedded solidly on timbers laid on the earth and lined up perfectly true and out of wind. The casting yard was about 50 ft. x 250 ft. A stiff leg derrick mounted on trucks which ran on two rails spaced about 30 ft. apart was used to handle the units in the yard. As soon as the units were sufficiently set, they were removed from the forms by this derrick and placed in storage piles to season before being placed in the building.

The parts were erected by a 10-ton stiff leg derrick, with

Fig. 3—Interior View of Completed Roundhouse.

70-ft. trussed boom and 12-ft. bull wheel, mounted on a triangular tower about 25 ft. high; this tower being mounted on trucks the same as the yard derrick and operated on two rails. As erection progressed, these trucks were moved around on a

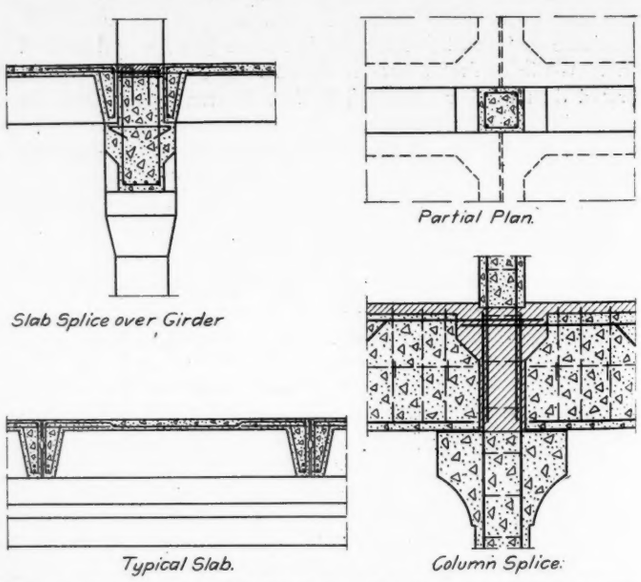


Fig. 4—Details of "Unit-Bilt" Construction of Engine House at Riverbank, Cal.

circular line following the contour of the building. As units were required for erection, they were lifted from storage piles and placed on a truck which was pushed by hand to a point where they could be lifted by the erecting derrick and placed in the building.

The foundations of the building, including the engine pits, were poured in the usual manner, except that the column foot-

ings were cast with a socket in which the unit columns were set, and the intermediate retaining walls were cast so as to engage in slots in the columns. The columns were placed in position, plumbed, and then the space under and around the bottoms of the columns was poured full of a 1:2 grout. After this grout had hardened, the wall slabs were placed in position, then the girders were set on the column brackets, and after that the roof slabs were set on the ledges of the girders, as will be seen.

Typical connections between columns and girders and between girders and roof slabs are shown in the accompanying cuts. The arrangement of the main reinforcement for the girders follows usual practice, some of the bars being bent up and carried over the supports. These bent up bars project from the ends of the units and lap over similar bars from the abutting girders. The length of lap is sufficient to develop the requisite stresses in these bars. When the grout is poured, these girders become as truly continuous as in ordinary monolithic construction.

The bars projecting from the tops of the columns into this grout give rigidity, and necessary knee brace action. The roof slabs rest for their full width on the girder ledge; projecting bars extend into the grout space over the girder. The stirrups in the girders also project from the unit girder into this same space, and after this space on top of the girder and between the ends of the slabs has been filled with grout, the strength of the girder is greatly increased on the compression side through the T-beam action resulting. Exhaustive tests have been made, a number of girders being tested to failure, both before and after this grouting had been done. Before grouting, the girder failed in compression, while the girders tested after grouting failed in tension after sustaining approximately double the load sustained by the girders tested without this grouting. The slab beams and a portion of the slab acted in compression with the girder.

The general layout of the building is in conformity with the Santa Fe standard low type roundhouse. The completed building is a true monolith; with the added advantage that the method of construction insures accuracy of design and a quality of workmanship and strength seldom obtained by ordinary reinforced concrete methods. The windows in the rear wall are about 15 ft. wide, and extend from a point about 3 ft. above the floor to the bottom of the eave strut. There are heavy pilasters at the sides of the windows, while the panel below the window is made of very light construction, so that an engine pushing through the wall would not in any way damage the structural part of the building, and would cause only slight inconvenience and expense in replacing the windows and panel beneath. At the end of the house, provision is made for further extension by making the end wall slabs so that they may be easily removed without damage and by providing special roof connections.

This method of putting up buildings, while new as applied to roundhouses, has been in general use for several years in various parts of the country in connection with the construction of factories, warehouses and grain elevators. The method is known as the "Unit-Bilt," and is patented by the Unit Construction Company, St. Louis, Mo.

An incident during the construction of this roundhouse furnished an excellent example of one of the advantages offered by "Unit-Bilt" methods. By mistake, the contractor received a quantity of sand containing considerable mica, which weakened the concrete. The first roof slab containing this sand broke as it was being lifted from the mold, after which all units containing that kind of sand, were tested on the ground with double the required load, and where any failure occurred, the unit was destroyed. With this method of construction it is possible not only closely to inspect each unit before placing it in building, but if desirable, each unit can be tested. Had the building been constructed by ordinary methods the defect would not have been discovered until the centering was removed, when the building would have collapsed. This roundhouse was erected by the Van-Sant Houghton Company of San Francisco, Pacific coast representatives of the Unit Construction Company.

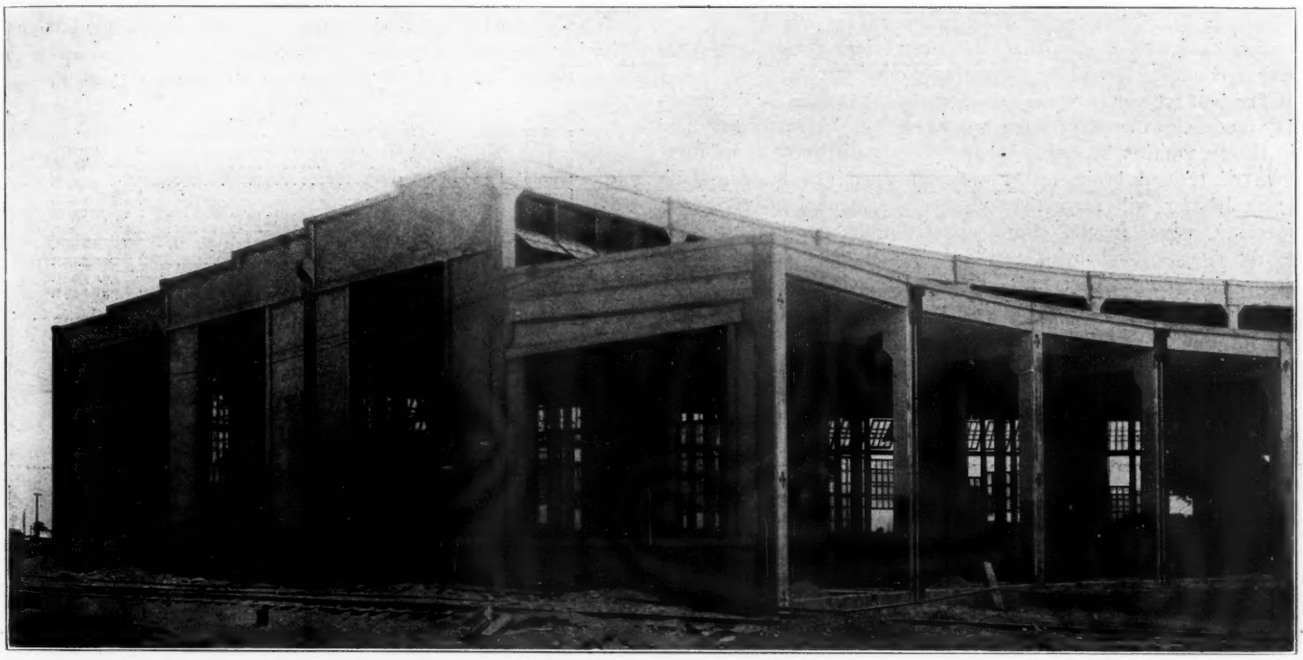


Fig. 5—Exterior of Santa Fe Roundhouse at Riverbank, Cal.

COPPER IN RAILS.

The Chicago, Milwaukee & St. Paul is having 10,000 tons of rail rolled this year containing 0.5 per cent. copper. This follows an order of 5,000 tons of the same composition rolled last year, which went through the past winter without a single broken rail.

THE COST AND HOW TO COUNT IT.

By E. R. Lewis,
Assistant to General Manager, Duluth, South Shore & Atlantic, Duluth, Minn.

The world of transportation is vitally interested in reducing to a truly economic minimum the cost of maintaining railway properties. Chief among these properties is the permanent way. A factor of its upkeep is labor. It is possible only by strict, accurate and continuous accounting to know the cost of maintenance of any railway system. In so far as the labor costs are concerned, this accounting must depend on data furnished by foremen in direct charge of the laborers who perform maintenance work.

Objections are urged that these foremen are overburdened with accounts in addition to the manual labor they have to perform; that their hours of labor are long enough; that the foremen should be allowed to rest instead of keeping books on Sundays and out of hours; and that many of the otherwise best foremen are not versed in mathematics or accounting. That there is a regrettable tendency to multiply railway reports, there is no doubt. This tendency is the result of thoughtlessness, or ignorance, or both. There is no sufficient reason why railway accounting should be increasingly cumbersome.

The best answer to these objections lies, however, in the growing tendency to employ foremen competent to keep accounts, and in the recognition by railway managements of the value of foremen of trained brain rather than of untrained brawn. One extra laborer will more than replace the manual effort of the foreman, whose mental effort, directed to overseeing his men, to the study of improving methods of maintenance, and to the accurate keeping of accounts, will far outweigh the loss to the company of the work he might do with pick or shovel.

The time is past when unskilled direction of unskilled labor is considered desirable. Unskilled labor is of most value to a railway when directly supervised by skilled foremen who keep as constant and careful watch over their books as over their laborers. The cost to a railway of foremen educated to the keeping of accounts often means no more than periodical trips over the different divisions by a clerk or clerks well versed in the desired forms of accounting, and capable of making the matters plain to the foremen.

If it is worth while for the railways to keep accounts, it is surely worth while to base them on accurate data. It must be borne in mind that the keeping of accurate accounts is a matter of education which must begin with the officer highest up. He must learn to recognize the benefits and must provide for the expenditures necessary for such true economies as the accounting will create. This education must reach all members of the staff, down to the man lowest down; for he is the working unit, and the accounting of his labor is the foundation of the economics of railway maintenance.

The generally accepted unit of maintenance values is one mile of single main track. Considering this as 100 per cent., the value of the maintenance of other track units, as one mile of industrial track, one turnout, or one railway crossing may be comparatively stated or equated.

It is, of course, true that circumstances of climate, soil, drainage, materials of construction and maintenance, methods of procedure, management and supply of materials and tools may be of such diverse nature as to exert pronounced influences on any results obtainable for comparative use. Nevertheless, it is practicable to collect and tabulate accurate figures which will give satisfactory average results over zones of several hundred miles extent. Good judgment must govern the division of such territory, to avoid diverse conditions within any one zone. In order to obtain proper results, the accounts for each zone, when considered, should cover a period of one or more complete years, thus accounting for the labor performed during all seasons.

An accounting has recently been completed covering a period of 12 months on a division of 300 miles of single main track and nearly 500 miles of branch tracks and sidings. Several section foremen in charge of large yards, others in charge of country sections of main line and others in charge of industrial tracks, were required to keep strict hourly accounts of labor performed for the maintenance of the several units of the permanent way. The accounts were kept in especially prepared time books under the various prescribed headings. Little instruction of foremen was necessary beyond the initial letter which accompanied the time book and a verbal explanation by the roadmaster.

Preliminary questioning brought out the fact that section foremen are in general prejudiced in favor of caring for main line tracks, rather than for turnouts, sidings, yard tracks, industrial tracks or crossings. They point out the difficulties of keeping tracks clear of cars and consequent loss of time; of the trouble of transporting track materials to their destinations; of the inferior drainage; of the comparatively poor ballast and materials of which these tracks are constructed. While there is much merit in these claims, the actual results show that these difficulties are magnified in the minds of the foremen because they must be to a degree surmounted through the personal efforts of the foremen themselves. Many of them prefer harder straight away work where they are free from worry.

The equated results of 12 months' accounting over the one division referred to are as follows:

Percentages of Labor Expended on Maintenance Units in Terms of One Mile of Main Track.

1 mile of single main track, Class "B"	100 per cent.
1 mile of single branch track	65 per cent.
1 mile of passing track	46 per cent.
1 mile of yard track	32.4 per cent.
1 mile of industrial track	24.0 per cent.
1 main track turnout	3.4 per cent.
1 side track turnout	1.4 per cent.
1 railroad crossing (1 track crossing only)	3.1 per cent.
1 highway crossing (highway over 1 track)	2.0 per cent.
1 mile of fence (5,280 ft. only)	2.7 per cent.
1 mile of right-of-way (100 ft. wide)	4.2 per cent.
1 farm crossing (over 1 track only)	0.4 per cent.

Though these percentages represent actual performance in maintenance, it does not follow that the maintenance is ideal or that the percentages are of unvarying ratio, applicable to all cases and to calculations on all railways. They will in fact vary from year to year on the same territory. But continuous similar records covering longer periods of time are valuable references and guide the railway officer in manning his territory. They make possible a just distribution of maintenance forces. Without some such actual basis of calculation, scientific management is not possible. No employer of labor can accurately distribute his laborers unless he knows how much work each one has to do.

THE FOREMAN PROBLEM.*

By J. D. Archibald,
Assistant Supervisor, Northern Central, Baltimore, Md.

Young men and sons of our present day foremen are not seeking positions as future track foremen for several reasons, which I think are as follows: First: To become a foreman it is necessary to begin as a laborer. This is distasteful to most young men. Second: The children of our present day foremen have had a chance to obtain a better education than did their fathers, and they are in a position to command better positions. Third: A track foreman must be within call at all hours. Many young men like to stop work when the whistle blows and not resume work until the following day. Fourth: Many railways are not paying wages that are attractive. Other departments pay better wages, thus attracting young men. Fifth: The promotion from laborer to foreman is slow.

The first reason above will always be at the bottom of the problem. Most of our present day laborers are from southern Europe and have a poor education. Some, however, are willing to be taught, and it is the duty of each roadmaster to study such laborers. As good men are spotted, they should be placed where they have a chance to learn good track work under a good foreman who will take enough interest to instruct them. The very best way to develop good foremen is by actual work upon the tracks.

*Received in the contest on The Foreman Problem which closed March 25, 1912.

COMPARATIVE ECONOMY OF TREATED TIES.

The Relative Savings of Treated and Untreated Ties, with and without Tie Plates and with Cut and Screw Spikes.

By R. J. Parker,
General Superintendent, Atchison, Topeka & Santa Fe.

Economy in track maintenance resulting from the use of treated ties is not alone measured by greater longevity through the increased resistance of the tie to decay, for a feature that enters in no little degree is that of mechanical wear. We might say that the conditions to which we must give special heed are longevity, mechanical wear and holding power of spikes.

While the latter may be considered under the general head of "mechanical wear," it is really a condition in itself and may with profit be given individual consideration.

Wood is subject to deterioration because of the attack of enemies of both the animal and vegetable kingdoms, and decay may begin within or without. The chief cause of deterioration of ties aside from mechanical wear is due to the penetration of the wood by vegetable spores which feed upon and cause the destruction of the wood cells. Many inquiries as to the cause of cross tie failure develop that 75 per cent. fail because of decay, and 25 per cent. because of rail cutting. The active introduction of preservative processes during the past few years has proven the practicability of tie treatment and our ability to resist the attack of fungi. However, I doubt if there is a railroad in the United States that has sufficient data to determine positively what may be expected and the information furnished will, therefore, be largely personal opinions expressed by various men based on their observation. My idea as to the values of different ties and the life we may expect of them may be briefly stated as follows:

Untreated pine in our territory in general will not last to exceed four years and in a considerable portion of our territory in the South it will not last to exceed two years. On the other hand, heart pine ties in our arid districts will give us ten to 12 years' service, for we have many ties on our Pecos Valley lines that have given this service already.

The average pine tie that gives us approximately four years' life untreated will give nine years' life if treated with creosote when used without tie plates. If plates are installed when the tie is new, the ties will without question give at least 12 years' life.

Untreated red oak ties will not average over four years' life, and while we have not been treating this timber long enough to be able to give a definite estimate of its life, some examined recently, that have been in the track for six years look approximately as good as when they were put in. We believe that 12 years is a low estimate on red oak ties treated with creosote if they are sound when treated.

Untreated white oak ties are generally estimated to last eight years, but an investigation made recently led me to believe that this was too high, and that we will do well if we get from six to seven years out of such ties. I know of numerous cases where white oak ties have been taken out in the last year that have not been in over four years. We have been treating white oak ties only a year, so that we have no idea yet what life we will get from the treated white oak, but reasoning from the service we are getting from red oak, I see no reason why we cannot expect at least two and a half times the service out of the treated tie that we will get from the untreated tie.

It is only in the last five or six years that gum was considered fit for tie timber, and many mistakes have been made in the preparation of this timber for treatment with the result that there has been a large loss of ties by decay before treatment, and also many gum ties were treated that were not fit. However, the gum ties that we have had the longest show up excellently, and I believe that if this timber is treated before it has a chance to decay we will get more spike holding power and resistance to rail wear than out of any other tie unless it be the creosoted white oak.

Different authorities say that the average life of untreated cross ties in the United States is about seven years. It has been demonstrated that decay can be prevented for a period of 25 years or more, but of what advantage is it to so lengthen the life of a tie if it must be removed in considerably less time from mechanical wear? Mechanical wear by rail cutting and by the destruction of the fibres by spikes opens up the interior of the wood to the attacks of fungi causing decay. Decay, of course, breaks down the structure of the wood and weakens it to withstand mechanical wear.

Obviously the variance in cost of maintenance in the use of treated ties as against untreated ties is greater: when no tie plates are used; when cut spikes are used as compared with screw spikes; when tie plates are not used, and with light rail as compared with heavy rail with wider base.

All of these are conditions that produce mechanical wear. With the opening up of the interior of the wood through the destruction of its fibres, we hasten the process of decay, for the fungi will more quickly attack untreated wood than treated. As longevity is the governing element in the ultimate cost of tie renewals, by shortening the life of the untreated tie, we thus place a greater distance between the final aggregate cost of track maintenance with the treated tie as compared with the untreated tie in favor of the treated tie, for we should consider not alone the initial cost of the tie and its insertion, but also the indeterminate sums of money spent in restoring the track to standard conditions, to which we might properly add the interest charges which will accrue in connection with that portion of the expenditures for ties.

For one mile of track with untreated ties, assuming 3,000 ties to the mile at a cost of $0.62 for hewn white oak and $0.12 for placing in gravel ballast we have

3,000 untreated ties at $0.62	$1,860
3,000 ties inserted at $0.12	360
Total	$2,220

Using treated ties of the same kind and under identical track conditions we have

3,000 treated ties at $0.82	$2,460
3,000 ties inserted at $0.12	360
Total	$2,820
Difference in initial cost in favor of untreated tie	600

However, assuming the life of the untreated ties at seven years and treated ties at 14 years, our final reckoning would show for the mile of track at the end of 14 years

Untreated	$4,440
Treated	2,820
Difference in favor of the treated	$1,620

which amount of money with the use of treated ties would have been available for seven years. At 4 per cent. compounded, the interest would amount to $511.78. So much for the interest charges which in defense of the untreated tie might rightfully lead us to the consideration of means of getting out of the untreated tie its maximum life. In doing so there would come to us first of all the following conditions on which the economical use of ties depends: Their preservation; their proper manufacture or shaping; the introduction in the case of heavy traffic lines of adequate tie plates to transmit the load from the comparative narrow rail base to the wood; and a form of fastening which will hold the rail closely to the bearing surface upon which it is to rest. Unless these conditions are observed the wave

motion of the rail together with the intermittent depression and lifting of the ties and the sliding back and forth of the rails will speedily result in their destruction. Again when it becomes necessary at periods ranging from a few months up to seven or eight years to renew rails, we are confronted with these problems: Usually the rail is of heavier section than that it replaces; the ties were already cut by rails having narrower base or even if the rail is of the same section the ties are cut and before the new rails can be placed it is indispensable that the ties should be adzed; labor is usually unskilled and is becoming more so every year; the adzes speedily become dull. Some ties are practically uncut, others are cut by varying degrees up to perhaps one or two inches. The result is that they are mutilated; depressions are formed which gather and hold moisture, the old spike holes plugged or unplugged are covered or partially covered by the base of the rail, spikes are driven into place and the ties are left in such condition that they are peculiarly receptive to moisture and germs that cause decay; therefore, this is another strong argument in favor of the treated tie because of the germ resisting qualities.

Tie plugs play an important part in the life of a tie. Ties fail quite as much from spike cutting as from rail cutting. This is especially true where the curvature is heavy and it is necessary to reline and regage track at frequent intervals; again the roadbed of a railroad is more or less elastic. All ties do not have the same bearing, so even in the most perfect track only approximately stable conditions exist. Because of the wave motion under passing trains, there are comparatively few spikes that are in contact with the rails, and while these spikes are redriven from time to time, it eventually becomes necessary to draw them and drive them in a new place. It is false economy to redrive a spike without immediately plugging the hole it formerly occupied.

The boring of the tie previous to treatment makes it practicable to thoroughly impregnate it with a preservative against decay at the point where it is most vulnerable, namely, where the spikes are inserted and where the wearing action of the tie plates and the rails occurs.

I have dwelt on the economy in the use of ties to illustrate how maximum service may be gotten out of untreated ties, but with all precaution taken, I do not believe that the average life of the untreated tie taken the country over will exceed seven years. It is true that in arid sections untreated ties will average ten to 12 years. The Santa Fe has a record of a large number of Arizona pine ties that have been in track on a secondary line 15 to 18 years, and are still good for one or two more years. It would seem that under such conditions, especially where the traffic and wheel loads are light, full tie plating or the use of screw spikes is unwarranted. Where these conditions prevail in one section of country, the opposite is true in other sections, where the average life of untreated pine ties is as low as two and three years. While this extremely short life of the tie might be increased through practical means of preventing decay that is hastened by mechanical wear, still the wisdom of resorting to such expensive methods to lengthen the life of a tie which without treatment can at best withstand the destructive effects of the fungi only a year or two longer, is questionable.

If 25 per cent. of the tie failures is due to mechanical wear, what part of that wear and tear is overcome by the use of tie plates, screw spikes and dowels? Some authorities say that if these remedies are adopted the average life of ties would be raised from seven years to 21 years or made to last three times as long. However, getting down to a more conservative basis, the great majority of maintenance men will agree that ties unprotected from rail wear and spike destruction will suffer a deterioration of at least 25 per cent., as previously mentioned. Therefore, let us assume that tie plates and screw spikes will entirely eliminate mechanical wear, as I confidently believe they will, and lengthen the life of ties just that much through their application. Let us see, then, what this amounts to in dollars and cents, taking the average maximum life of untreated ties to be seven years and treated ties 21 years, or three times greater, which experimental tests would seem to justify.

One mile of track with untreated ties, cut spikes and no tie plates.

3,000 ties at $0.62	$1,860.00
12,000 spikes at $1.55 per cwt	99.20
3,000 ties inserted at $0.12	360.00
Total	$2,319.20

One mile of track with untreated ties, screw spikes and tie plates.

3,000 ties at $0.62	$1,860.00
12,000 screw spikes at $0.0336 each	403.20
6,000 tie plates at $0.1475 each	885.00
Boring ties for screw spikes	30.00
3,000 ties inserted at $0.15	450.00
Total	$3,628.20
Cost for 7 years	$3,628.20
Cost for 5.25 years	2,319.20
Difference in favor unprotected tie	1,309.00

On this basis in 21 years, ties with tie plates and screw spikes would have to be renewed three times, and ties with cut spikes and without tie plates, four times. Assuming that the screw spikes and tie plates will wear out three ties or have a life of 21 years, and that we can use the cut spikes the second time, the cost for one mile of track would be, in 21 years:

UNTREATED TIES, CUT SPIKES AND NO TIE PLATES.	
12,000 ties at $0.62	$7,440.00
24,000 spikes at $1.55 per cwt	198.40
12,000 ties inserted at $0.12	1,440.00
Total	$9,078.40
UNTREATED TIES, SCREW SPIKES AND TIE PLATES.	
9,000 ties at $0.62	$5,580.00
12,000 screw spikes at $0.0336 each	403.20
6,000 tie plates at $0.1475 each for screw spikes	885.00
Boring 9,000 ties for screw spikes	90.00
9,000 ties inserted at $0.15	1,350.00
Total	$8,308.20
	9,078.40
Difference	$770.20

This shows a difference of $770.20 in favor of construction with screw spikes and tie plates in the place of cut spikes without tie plates, and merely covers the mechanical wear. When due consideration is given to the saving in maintenance expense by reason of frequent redriving of spikes, in the case of cut spikes, and the cost of restoring track to standard condition subsequent to tie renewals four times in 21 years in the one case as against three times in the other, I believe the argument in favor of screw spikes and tie plates has considerably the best of it. Coupled with this is the fact that disintegration caused by decay is hastened by mechanical wear in the case of the unprotected tie, which in itself would far more than offset the difference that the initial expense in the construction would bring about.

These are approximate figures at best, but are sufficiently accurate to command respectful attention. Still further comparison can be drawn by placing the untreated tie with cut spikes and without tie plates against the treated tie with screw spikes and tie plates, thus:

UNTREATED TIES, CUT SPIKES AND NO TIE PLATES.	
12,000 ties at $0.62	$7,440.00
24,000 spikes at $1.55 per cwt	198.40
12,000 ties inserted at $0.12	1,440.00
Total	$9,078.40
TREATED TIES, SCREW SPIKES AND TIE PLATES.	
3,000 ties at $0.82	$2,460.00
12,000 screw spikes at $0.0336 each	403.20
6,000 tie plates at $0.1475 each	885.00
Boring 3,000 ties for screw spikes	30.00
Total	$3,778.20

The foregoing tabulation is based on untreated ties, unprotected from mechanical wear, as having an average life of 5.25 years, which is allowing seven years as the average life of tie less 25 per cent. for mechanical wear, as compared with treated ties fully protected from mechanical wear with screw spikes and tie plates which experience indicates last two and a half to three times longer than an untreated tie unprotected from mechanical wear. It will be noticed that there is a difference of $5,300.20 in favor of the treated tie protected from mechanical

wear, simply taking into consideration the cost of material and the work of inserting the ties. When we add to this the saving in interest charges and the indeterminate cost of rehabilitating the track after each disturbance caused by tie renewal and the difference in running maintenance expense caused by redriving spikes due to the frequent relining and regaging necessary with the cut spikes, especially where no tie plates are used, we have shown in dollars and cents the best possible argument in favor of the treated tie fully protected from mechanical wear. These figures are all based on current prices, although there is every reason to believe that instead of the price of ties remaining the same it will steadily advance to such an extent that within 15 or 20 years we will be paying at least twice as much for ties as we are today. Another strong argument in favor of inserting the chemically treated tie is that their length of life will be increased and a correspondingly smaller number of ties will have to be bought from now on.

In figuring on the use of screw spikes in the foregoing tabulation I have not taken into consideration the use of dowels. Some railroads prefer the use of dowels at the initial insertion, and the A., T. & S. F. has experimented with them, but has found that the screw spikes hold equally well and have perhaps equal lasting qualities when the tie is simply bored to receive the screw spike and thoroughly treated after boring. If it is desired to consider the dowels with the initial insertion, we might add to the figures I have shown the cost of the dowels, which averages about 1¾c. each; the cost of boring ties and inserting dowels would scarcely be any more than the cost of boring ties to receive the screw spike. Some railroads use eight spikes to the tie; others six, but the figures I have given contemplate using four. Another argument in favor of the screw spike is the fact that it is in itself a rail anchor as well as a spike.

In conclusion it might be well to say that any method of inserting ties in track that overcomes unnecessary and deep abrasion should receive highest commendation, whether it be with treated ties or untreated ties, because it is due to decay that fully 75 per cent. of ties fail. Any method of handling that will prevent an unnecessary opening into the interior of the tie and which will prevent moisture from creeping in, is worth while. Tie tongs should displace the track pick in performing the function for which they are intended.

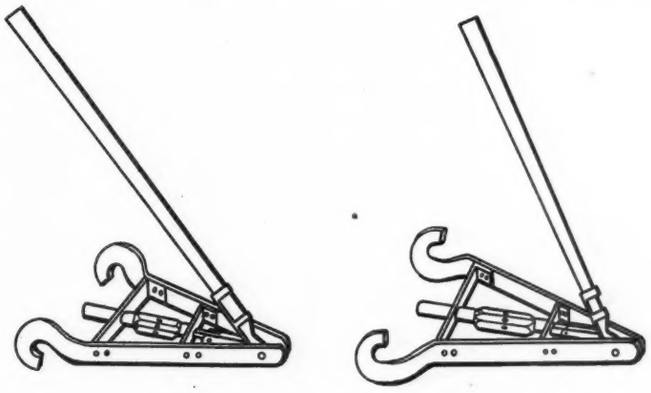
CURVING RAIL WITH A LEVER BENDER.

By L. J. Evans,
Western Pacific, Stockton, Cal.

In the issue of the *Railway Age Gazette* of November 15, 1912, there appeared an article entitled "Jim-Crow Lever Bender vs. Roller Bender for Curving Rails." In my opinion the lever eccentric bender is one of the most efficient track tools to be had today if properly handled, and if it receives the same attention it will compare favorably with a steam curving machine for curving rails. Several years ago I had charge of track laying on an extension up a mountain side to a smelter site. For almost the entire length the track was a series of curves ranging from 8 to 16 deg. As no steam curving machine was available a lever bender was used. After this had been working two days it was found that the track laying was being seriously retarded by the output of the rail curver, 40 to 45 rails per day being as many as could be turned out by moving the curver along the rail and lowering the plunger every 14 to 16 in.

It occurred to us that by allowing the lever and all working parts to remain in the same position as we had been using them and inverting the arms of the bender, we could use it with greater economy and despatch. We therefore built a platform of ties and 4 in. planks on which we fastened the curver securely. Having available a number of stationary rollers which had been used on a steam curver the previous year, we placed them up so as to allow the plunger of the curver to press against the web of the rail. As the flange of the rail was wider than the clearance in the arms of the bender, two short pieces of iron ¾ in. x 2½ in. x 7 in., with one end turned outward 1½ in., were placed between the arms of the bender and the web of the rail, thus clearing the flange and preventing the rail from tilting.

A foreman and eight men had been employed on the bender up to this time. It required 4½ hours of their time to make the change in the bender and build the platform. With the new arrangement the gang was reorganized with four men working the lever and two men on each end of the rail with tongs, leading the rail on the rollers through the curver. While 40 to 45 rails was considered a good day's work with the bender as first used, a careful count kept for 12 days following the



Lever Rail Bender in Ordinary and Inverted Position.

change showed an average of 73 rails per day. With a force of one foreman at $3.50 per day, and eight men at $1.60 per day, this cost $0.2233 per rail.

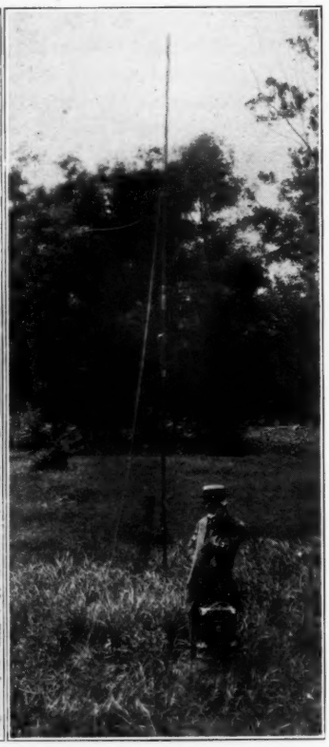
The previous year the average number of rails curved by the steam curver was 115 per day of 10 hours. With a crew composed of one engineer at $4.25 per day, one foreman at $4 per day, and 10 laborers at $2 each per day, this cost was $0.237 per rail, or $0.0137 more than with the lever eccentric curver. The above is simply a comparison of labor charges and does not include the depreciation of machine, interest on money invested, fuel, oil and other incidentals, which, if considered would give the lever bender a still more favorable comparison.

PORTABLE TELEPHONES FOR EXTRA GANGS.

When an extra gang is working on a line that is equipped with telephones for train despatching it is a great convenience and a means of saving considerable time for the gang and for trains using the road if the timekeeper is equipped with a portable telephone set which he can cut in on the line wherever the gang is working. By the use of such a set he can keep posted on all train movements either by asking the despatcher where a given train is, or simply by listening to the orders that are going over the wire. When trains are running late or extras are frequent it is common for a rail or ballast gang to hold up trains until the track can be closed or a run-off finished. On the other hand, the foreman may plan the gang's work so as to have the track ready for service at the time a regular train is due, but such a train may be late enough to cause considerable loss of time to the gang. If the foreman knows exactly when trains are coming he can plan the work of the gang so as to eliminate delay both to traffic and to the men. A telephone is also very convenient in making reports and calling aid in case of emergencies. P. J. McAndrews, roadmaster, Chicago & North Western, at Belle Plaine, Ia., has been using a set made by the Western Electric Company, shown in the accompanying cuts. The box contains the complete mechanism, and the jointed pole for making the line connection is the only

other equipment required. A line wire about 150 ft. long is supplied which allows the timekeeper to arrange the connection at the most convenient point. The instrument may be kept in a bunk car, although when possible the foreman's car is provided with a permanent telephone. The connecting pole has two hooks on the upper end, one of which is attached rigidly to the pole, and the other is carried on the end of a wire which can be pulled out for several feet from the upper end of the pole. To make a connection with the line wires the hook connected to the movable wire on the pole is dropped over one of

Telephone and Rod in Shape for Carrying.



Telephone in Use Showing Connection to Line Wires.

the line wires, the pole is pulled down enough to draw out this wire for a distance of several feet, and the hook attached to the pole is then dropped over the other line wire. In this position the hook serves both as an electric connection and a means of supporting the pole. The cost of the instrument is about $25, and the saving in the time of a gang can easily be made to amount to many times this figure in a season's work.

TIME CLOCKS FOR TRACK WALKERS.

The Pennsylvania Railroad has recently supplied the track walkers on certain districts with time clocks to insure that the required inspections of the track are being made. Previous to the installation of these time clocks a card system was generally used. While this was the most satisfactory method which had been developed up to that time, it was not entirely reliable, as it was necessary for the operators at the various stations to mark the track walker's cards and collusion between the track walker and operator sometimes resulted.

The time clock system can be so arranged that the track walker's beat may include the entire track foreman's subdivision or it may cover only a limited portion of it. Patrol boxes containing keys each having a different number or letter are located at points where it is desired to secure the records. The boxes are so equipped that they may be placed on telegraph poles, mile posts, or any other permanent structure. Each patrolman carries a time or registering clock. As he makes his rounds he unlocks the metal patrol box with his master key and takes from the box the key for that station, which is attached to the box by a substantial chain. He operates the clock with this key, registering the time and the number or letter of the station on a paper dial in the clock. He then proceeds to the next box, where he repeats the operation. In this way he makes an accurate record of his patrol.

The keys are so made that it is impossible for the patrolman to substitute false keys. It is also impossible for him to remain at any one station and record for the entire patrol without detection, as the keys for the various stations are of different designs. When the track walker has completed his work he delivers his clock to the section foreman who removes the paper dial and sends it to the supervisor for permanent record.

CONTINUOUS RENEWAL OF TIES.

The following from an English contemporary describes the method of renewal of ties to face rather than singly, and is of interest to track men in this country, because of the recent discussions of this subject.

Experience from the past has evolved a system of making the necessary renewal of the sleepers, which are an important part of the equipment, in a way best suited to the general circumstances of this country, and it may be laid down, as an almost universal rule, that sleepers are renewed in bulk with the renewal of the rails. Here and there it may be necessary to renew any single sleeper which has deteriorated more rapidly than the others, but such cases are exceptional, and generally the renewal of the sleepers is carried out with the renewal of the rails. This will occur, under normal conditions, in about 15 years, but must be largely determined by the service on the track, and local conditions.

After such a period the sleepers will not, of course, all be in a uniform condition, so that it is necessary to grade them, usually, into three classes. Those in the best condition would be used on small branch lines with a light train service or in sidings; others in less good condition might be used whole as they are, or cut up as required, for posts or supports or any other of the many purposes demanded by railway work, other than in the track bed; and the last of the three qualities is classified as firewood and only used for that purpose.

The track renewals are in this country mostly carried out on Sunday when the train service is considerably less than on week days, but as much as possible is prepared beforehand so as to have the minimum interference with the running of trains and to reduce Sunday labor.

As the space for handling the material is often very limited, the new sleepers, already prepared by having the chairs affixed to them, to be put in the track are brought out in bulk from the nearest depot, and the old material is removed in a similar manner. The old rails, sleepers, etc., are removed from the track as soon as possession of the line is obtained by the engineering department, and loaded up into the ballast train as soon as possible for despatch to the depot. Meanwhile the new equipment is put in its place so that the traffic can be resumed over the section of newly-laid track at the end of the day's work. A length of about a mile is dealt with at a time, and the interruption to the traffic is only for a period of about 12 hours at a time when it causes the least inconvenience.

Although hardwood sleepers, uncreosoted, have been used to a small extent, the usual timber employed is the Scotch pine from the forests on the Baltic Sea. The sleepers are generally creosoted under pressure before being put into service.

Proposed Line for French Congo.—The French have under consideration the building of a railroad from Libreville, on the French Congo coast, to Nouvelle Anvers, on the Congo river. The first two sections of the line, N'Jole to Makakou, a distance of 300 miles, have already been surveyed.—*Mining and Scientific Press.*

EFFICIENCY OF MAINTENANCE OF WAY LABOR.

A Discussion of the Problems of Section and Extra Gang Organization and Methods of Removing Some of the Defects.

By H. C. Landon,
General Manager, Watauga and Yadkin Valley Railroad, North Wilkesboro, N. C.

The items upon which the efficiency of maintenance of way track labor depend, are the character of the men forming the gangs, character of the foreman, the tools and appliances, daily reports and supervision. The basis of the maintenance of way track labor organization is the section gang. The floating or extra gang is an auxiliary to the section gang and performs work which cannot be done by the section gang during the busy season. It is upon the organization of these gangs that the best results depend; it is also in these gangs, particularly the extra gangs, that much valuable time is wasted during the working season.

CHARACTER OF GANGS.

Ordinarily, the section gang consists of only two or three men, or even less in winter, but it may be increased to six, eight, ten or more in the summer season. With the smaller gangs the greatest efficiency is secured, as a better class of men, frequently native laborers, is secured. If a gang of three men is maintained during the winter and the summer gang is only six men, at least 50 per cent. of the gang is composed of experienced men who know what to do under proper direction. This, however, is not the case where on our trunk lines only one or two men are employed on a section during the winter, and six or more during the summer, or two-thirds of the time. If the men are of any value whatever, they are picked up by contractors and others, leaving only old and inefficient men to be hired either in winter or summer. In the spring, therefore, the important unit of the maintenance of way organization often starts out with all new men unacquainted with the work, and we expect of them the full efficiency of the old-time section gang. By proper handling and careful instructions the men are improved gradually, but we generally find that the work is not progressing as it should, and as additional men are put on the expenses are accordingly increased. Careful training by experienced foremen, and supervisors or road-masters can in time make an ineffective gang somewhat effective, but it takes time and therefore money.

The remedies for the ineffective gang are sufficiently numerous. It is the common practice to shut off all work in winter, and to cut the section gang to the minimum in hours and men. This is a source of loss, as much efficient work can be done in the winter season, at least in the middle states. This work is necessary and should be done where track conditions are often such as to cause criticism. The gage of many of our roads, especially those with much curvature, can receive attention, missing and cut spikes can be replaced, rails can be rolled by adzing the ties, fences repaired, drainage improved, etc. Of course, there are short periods where gangs or men can be laid off to advantage, and if short no bad results will follow. If we can keep small gangs during the winter we then have a good nucleus for the larger gangs during the summer, there will be much less work to perform, much less labor will be required to perform it, and economy is effected.

Wages that will attract better men should be paid, so that the effect of the winter lay off will be counteracted. Railroad managers invariably argue that only the lowest wages should be paid to section men. While the proposition might seem radical, it is believed that for the men who are worth it, an increase in the price of section labor would decrease the cost of maintenance. Graduated pay of men is also important and necessary to get results. There is no question but that a minimum rate can be established for green men and a higher rate per hour for others with two years' experience, or who can pass certain tests designated by the proper officer, and a still higher rate per hour for natives with three years' experience. An attractive rate should be paid for firstmen, who may be promoted to foremen. I believe it would work to advantage also to have a higher salary for natives than for green foreign laborers, and that there are many other inducements to improve the class of labor, and therefore increase the efficiency.

It is in the extra or floating gangs that the greatest waste of labor and money prevails. Twenty-five per cent. efficiency would probably be large for many of these gangs. On most roads they are made up of foreign laborers furnished by labor agencies of various kinds, who of course always furnish the best they have. These gangs are composed of men who do not speak our language, and who are not familiar with our ways. Their manner of living does not provide the sturdy bodies necessary to active and productive labor. For our extra gangs there does not seem to be any other source of labor, and so probably we must use the foreign laborers.

The first thing which should be done is to cull out the old, young and weak, for the very weakest material offered is for extra gangs. The very moment we begin to cut out and clean out the weak and inefficient, we encounter another difficulty which is not always considered, but is generally a reality. The foreign labor is clannish, and the gangs we secure seem to be composed of relations. If you remove one the whole gang may go and the work stops. Occasionally a good gang is secured. The remedy to apply to improve the efficiency is to continually keep after the labor agents to supply good laborers and get rid of the poor laborers at once. Provide fairly good quarters for that class of foremen who will carefully instruct and work their men, and have efficient assistant foremen who are workers, who will see that men while working do not get in each other's way, and who will determine what is a good day's work. Establish a piece work system and pay the men for what they do. This latter plan can in many cases be established.

Cheap labor is always expensive. To illustrate the economy of good labor, although a high price may be paid, I will cite a case where a telegraph line was being built in connection with a new railroad in New York. The railroad company furnished a foreman and a gang to dig the holes and raise the poles and to help string the wires. The work was begun late in September, and was carried on into the winter. In October the cost of the finished line was $1.43 per pole, working all foreign laborers. In December, however, the cost had run up to $2.40 per pole, on account of bad digging and bad weather. The wages paid were $1.40 per day for common laborers. Native labor was plentiful at $2 per day, and it was resolved to experiment with part native labor and part foreign labor. The cost was at once reduced to about $1.85 per pole. The following month all native laborers were employed, and with worse digging, much of it being in rock, and in the middle of the winter the cost per pole was reduced to less than $1.40, and kept down to about these figures until the work was completed. If we can accomplish these results on the construction of a telegraph line, we can do the same on the maintenance of track. On some of our lines extra gangs are employed for a short time during the summer. If the gang is any good, it is only just beginning to be efficient when it is laid off and the men scatter to find work elsewhere, or return to their foreign homes. The conclusion generally is that we could have done the same work better with half of the laborers, had there been a better class of laborers engaged. I do not believe we should

encourage a higher price for the class of laborers now furnished on extra gangs, but rather should draw a better class of extra gang laborers by a higher rate if necessary.

THE FOREMAN.

The section foreman is the man who should and who can advance the efficiency in labor, and who is at fault if the labor is not efficient. On many of our railroads he is well paid, so that we should get better foremen, and therefore better results from our laborers than we do. Our foremen are not carefully trained, and they in turn are too careless in their instructions to the men, and both they and the men are indifferent to the value of labor. The foremen do not understand the value of materials, and while economy has been preached to them in many different ways, it has not appealed to them. The company pays the bills, and the cost of tools and materials has not been explained in a way to impress upon them their value. The training has only been general and desultory. The supervisor has discussed with them in a general way the tamping of ties, loose bolts, drainage, etc. Systematic arrangement of work has also been discussed in a way. These are the average foremen.

Foremen should be trained to become money savers and labor savers. The average foreman is not the only cause of our inefficiency, but he so often allows the bad conditions found on our railroads that we wonder why more serious accidents do not occur. To increase the efficiency of foremen radical methods must be pursued. On each section there should be at least one man who can successfully fill the job as section foreman, known as a firstman or assistant foreman. When the hours are cut in the winter, or the gang is laid off temporarily, this man should be kept at work. If this is not done, the firstman who has had some training, is picked up by some other road or industry, the result being that when one wants a good man he has to go to some other road to get a man who will then require some additional training before he is satisfactory. To carefully guard your interest the foreman should be interested and enthusiastic, and should believe in the future of the road as though he was the highest official. He will then watch the material and labor to see that no money is wasted, the bunching of men will be avoided and a certain specified amount of labor will be accomplished daily. He will so plan his work that he will know exactly what is going to be done the following day or the following week. There will be no mis-strokes, and every move will count for something. Six men will not be carelessly sent to remove a tie when two or three men can do it. All work will be carefully planned, and when the work is started all tools necessary to do the work properly will be at hand. The division officials will be out on the ground enough to see that the work is being properly looked after and effective work recognized.

In order also to make the foreman and assistant foreman understand the importance of their work, all foremen and assistants on the division should be called together at some convenient time for general instructions. It is believed that when the foremen are duly impressed with their responsibilities such improvement will follow. That he is not enthusiastic and is not familiar with his four or six miles of section is a familiar fact. It is rare he can tell you much about the curvature, gage or elevation, and if you check him up, you will find him more often wrong than right. If he is unobserving in these things one can be assured that he gives the saving of labor or material very little attention. It is true that he is anxious for good track, but he wants much help and money to get it. The real remedy, therefore, is the careful selection and education of the foreman and to have the foreman know what he is getting for the labor and material that he uses, and the cost of the tools and supplies that he uses.

TOOLS.

On some of our lines the efficiency is decidedly lessened by the lack of proper tools or tools not properly taken care of. It is not uncommon to see a large gang of men laying track with only one or two adzes, and these about as sharp as a garden hoe, chewing the tie surface instead of cutting it. The fact that grind stones were lying idle in the tool houses has not occurred to any one. It is not uncommon to see gangs working partly equipped with tools, which is a mistaken policy. It is better to have too many tools than not enough.

Care in the use of tools is equally important. On a short line with which I was connected, it was difficult to get sharpened tools until an appeal was made to the proper official to establish a division blacksmith shop in the supervisor's headquarters to take care of our own tools and hand cars. The efficiency of the work was then decidedly increased. While the mechanical department aimed to repair tools promptly, it was difficult to get them to and from the shop quickly and properly repaired. The hand car, which is the most important tool or appliance on the section is rarely ever given proper attention. I have seen repeated cases where men walked to and from their work, all on account of the need of a $25 hand car which the management failed to furnish, the hand cars originally having not been properly taken care of, due to carelessness on the part of the foreman and lack of proper instructions. On one road 50 per cent. of the cars were unfit to use, and the men were unfit to work after they had succeeded in getting the cars to their destination. The cars were sent to the shops for repairs, and when returned were about as serviceable as before they were sent to the shop. With the maintenance of way blacksmith shop it was demonstrated that these hand cars could be satisfactorily repaired, and instead of only 50 per cent. of the cars being available, at least 97 per cent. were in running condition, and all were available. It is believed that the efficiency was increased, at least one man to each gang, due to the easy running cars with which they were furnished.

REPORTS.

If the section foreman is aware that the amount of work he accomplishes daily is carefully and intelligently watched, he is anxious to make as much progress as possible. As the supervisor or roadmaster passes over the section from time to time he gets a fair impression of what is being done and spurs on the laggards to greater effort. There is, however, in this method no way of comparing the work of the various sections and gangs. This can only be accomplished by daily reports, showing the work done and the amount of material used. The reports should be sent to the supervisor daily, who in turn completes them and forwards them to the division engineer not later than the second day after the work is performed. The division engineer or other officer to whom these reports are sent knows exactly how much money is spent daily, the total for the month up to date, and also the progress of each section gang. The very fact that these reports spur each man who is anxious to put forth his best efforts leads him to perform the greatest amount of labor possible, and to eliminate the waste of the time of his men in useless puttering around.

SUPERVISION.

The desired supervision of the various gangs rests with the supervisor or roadmaster who will insist upon having intelligent and ambitious foremen. He will organize the gangs and secure men if possible, who will make good foremen and will take measures to train them. He will see that the work progresses systematically over the sections, beginning at one end of the section and completing the work as it progresses, and will see that the gangs are not moving uselessly about from one end of the section to the other. As a general proposition hand cars will only be used in the going and returning from work morning and night. A hand car moving over the track at any other time should be subject to investigation.

The supervisor or roadmaster will see that proper tools and materials are at all times provided, and will especially see that tools are taken care of and kept in condition to do the work properly, only sharp tools being permitted to be used. It is

necessary for the supervisor or roadmaster to be with the men as much as possible and to point out to them the necessity of avoiding unnecessary and wasted efforts, and keep them intelligently informed as to just what is expected. If the results expected are clearly outlined, the work will move with the least possible labor loss.

CREEPING OF RAILS.

By Paul M. La Bach.

Assistant Engineer, Chicago, Rock Island & Pacific, Chicago.

The term creeping is used to denote the sliding of the track or its component parts in the direction of the axis of the permanent way. There are few causes of creeping found in the track itself, such as those due to temperature changes, the creeping of sufficient magnitude to cause track disturbances being, except in very rare cases, the result of forces generated by the rolling load. A large variety of subdivisions may be made but the following will include all those ordinarily found: Creeping due to the tractive power of the locomotive; creeping due to the friction of locked wheels; creeping due to the wave motion in the track; and creeping due to the discontinuity of the track structure.

CREEPING DUE TO THE TRACTIVE POWER OF THE LOCOMOTIVE.

The force acting at the circumference of the drivers tends to move the rail in a direction contrary to that of the locomotive. If we assume that the force due to the steam pressure is constant we will have the following equation:

$$F = P \times \frac{r}{R} \frac{\sin (X + B)}{\cos B} \text{ where}$$

P = Steam pressure.
r = Radius of the crank.
R = Radius of the driver.
X = Angle of crank.
B = Angle connecting rod makes with axis of cylinder.
\+ = Angle below center.
— = Angle above center.

It will be seen that F changes continually in steam engines and has been found to vary from 20 per cent. below to 20 per cent. above the average in trials made. As this force also decreases as the speed increases, the reader is referred to the curves shown in the article by C. L. de Muralt in the *Railway Age Gazette* of January 17, 1913, referring to both steam and electric motive power. It has been found in practice that the force exerted in this manner is always exceeded, on the steam roads at least, by the forces due to the mass and velocity of the train. Where motors are placed on all axles, different results might be expected, but published accounts of them are not at hand. For those cases in which trains are hauled this action may be regarded as favorable, as it counteracts greater forces which will be spoken of later.

CREEPING DUE TO LOCKED WHEELS.

As long as the wheels continue to revolve upon their axes, without sliding, the friction on the rail is static, but when they become locked and begin to slide the friction becomes dynamic. The following coefficients are in common use for the different speeds, although 1/7 is considered a fair average by some.

DYNAMIC FRICTION BETWEEN WHEEL AND RAIL.*

Just coming to rest....0.242	34.1 m. p. h..... .065
6.8 m. p. h..... .088	40.9 m. p. h..... .057
13.6 m. p. h..... .072	47.7 m. p. h..... .040
27.3 m. p. h..... .070	54.5 m. p. h..... .038

When the brakes are applied the velocity of the train gradually decreases to the point where the brake-shoe friction equals the dynamic friction of the wheel and rail. When this point is reached the dynamic friction of the brake-shoe and wheel rises owing to the reduced speed of rotation and locks the wheel while it slips over the rails because the static friction between wheels and rail has become dynamic friction and is thus reduced from 0.24 to about 0.09. As the speed is reduced, in sliding, the dynamic friction is increased and brings the train to rest. The maximum effect of creeping will therefore be found where stops are made and will be in the direction of running.

*Henderson, Locomotive Operation, page 204.

CREEPING DUE TO WAVE MOTION.

The creeping of the rails has been thought by many to be the direct result of the wave motion in the track under rolling loads. Prof. Johnson advanced the theory that the movement was similar to that of oscillating fluids. That liquids do creep is undoubted and can be calculated but the height of the wave is

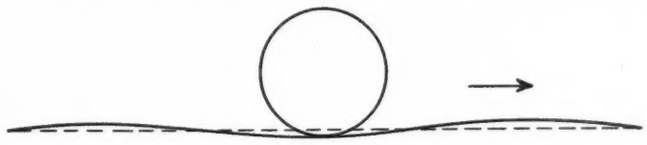


Fig. 1.

much greater in proportion to its length than in the case of the rail.

When a single wheel rolls along a track we have a depression under it and an elevation in the front and rear.

Mr. Coüard made the following record from experiments* performed in June, 1903: "When the first wheel of the engine is at 6 meters (19.68 ft.) the movement of the cross-tie, from low to

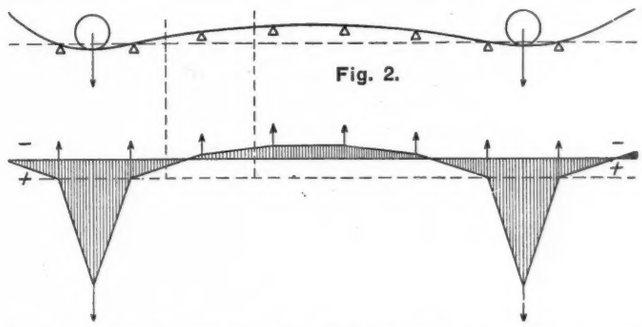


Fig. 2.

Figs. 2 and 3—Upper Part of Diagram Shows Deflection Under Two Wheels of Equal Weight and the Lower One the Corresponding Bending Moments.

high, begins. When the first wheel of the engine is at 3 meters (9.84 ft.) the displacement is maximum. When the first wheel of the engine is at 2 meters (6.56 ft.) the movement from high

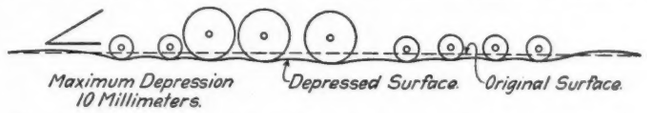


Fig. 4—Rail Depression as Ordinarily Found Under Engine and Tender.

to low, below the initial position, begins. When the wheel is on the cross-tie the depression of the tie reaches the maximum."

This motion is further illustrated by Figures 2, 3 and 4.

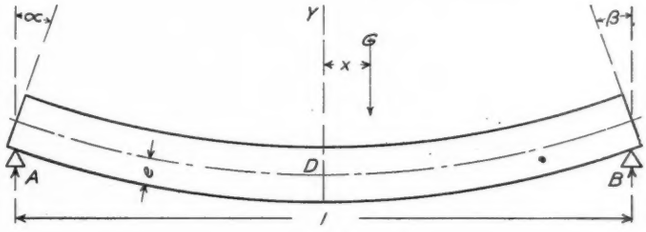


Fig. 5.

Dr. H. Zimmermann has made a mathematical investigation of the subject by the use of calculus which is too long to re-

*Track Deformations by Cuënot, translation by W. C. Cushing. *Railroad Gazette*, 1907.

produce here. His conclusions will be understood by referring to Fig. 5.

G = Wheel load.
I = Moment of inertia.
E = Coefficient of elasticity.
x = Distance of load from axis Y passing through center of beam.

As the load is a rolling one it will increase from O to G and the lower side of the beam increases in length over the upper side. The total sliding may be expressed by the following formula:

$$W = (x + B)e = \frac{Ge}{2EI}(l^2 - x^2)$$

This will only occur where the least resistance is to be overcome. In the figure shown this would be at the point A as at the instant shown A has the smaller reaction and therefore the least friction. If we move the load in the opposite direction, that is from A to B, then the slipping will occur at B. When x = o we will have the maximum value.

$$W = \frac{Gel^2}{2EI} \qquad (I)$$

When the load continues to advance beyond the center of the beam towards the right support, the beam under the left support begins to move towards B, as that reaction becomes the largest. The whole beam moves in the direction of motion of the load. This movement will be measured by W. Zimmermann represents the work of friction developed by this movement for a beam supported on two points as

$$A_1 = \frac{G^2\, efl^2}{6EI} \qquad (II)$$

For a beam fastened at one support to prevent creeping this would become

$$A_2 = \frac{G^2\, efl^2}{6EI} \qquad (III)$$

In the above formulae

G is the rolling load.
f is the coefficient of friction of the beam on its supports.
l is the distance apart of the points of supports.
E is the modulus of elasticity.
I is the moment of inertia.
e is the distance of neutral fibre from outer fibre.

From (I) and (II)

$$A_2 = GWf$$

If we wish to know the mean force P which performs the work A we will have

$$PW = GWf$$

Whence

$$P = Gf$$

That is to say that the force which moves the rail in the direction of its length is nearly equal to the friction of the wheel on the rail. In order to get the magnitude of this force we will assume the following values:

G = 14,000 lbs.
e = 2.65 in.
l = 20 in.
E = 29,000,000
I = 41.30

From formula I

$$W = \frac{14{,}000 \times 2.65 \times 20 \times 20}{2 \times 29{,}000{,}000 \times 41.30} = \frac{7{,}000 \times 2.65}{72{,}500 \times 41.30} = \frac{18{,}550}{2{,}994{,}250}$$

$$= .0062 \text{ in.} = \frac{1}{160} \text{ in.} = \text{sliding.}$$

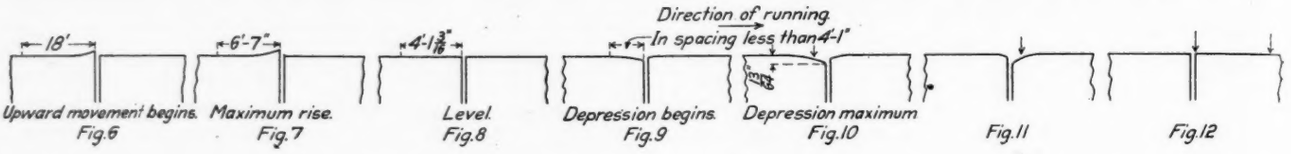
$A_2 = GWf = 14{,}000 \times 13.33 \times 0.15$
$= 28{,}000$ ft. lbs. = work of friction.
$P = Gf = 14{,}000 \times 0.15 = 2{,}100$ lbs. = reaction due to the work.

The sliding which would otherwise take place will be prevented by the rail attachments and the butting of the rails themselves. The general law expressed by the foregoing is that creeping due to wave motion increases directly as the load and the square of the tie spacing and inversely as the stiffness of the rail.

It will follow as a corollary that this kind of creeping will increase with the speed, the stress in the rails and the traffic.

CREEPING DUE TO THE DISCONTINUITY OF THE TRACK STRUCTURE.

A great many experiments have been made abroad in order to find out just what happens in the rail joint, the principal ones being those of Zimmermann, Flamanche, Coüard, Cuenot, Ast and Wasintynski. For present purposes it will not be necessary to go into the question, as they did, for while following the same principles, our joint fixtures are not the same in detail. As a graphical illustration, the following from the experiments of Mr. Ast has been selected. The joint has no filling.



These diagrams show in a general way what happens to the first wheel of an engine when running if the action of the fish plates is nil. There will always be an upward step in front of the wheel, and consequently a blow delivered which is proportional to its height. By referring to Figs. 2 and 3 it will be seen that there is a tendency to rise between the first and second wheels so that the influence of the first wheel is felt in an upward direction, until the second wheel passes the joint. This will increase the upward step. The remedy which we apply is an attempt at continuity. If a perfect fishing could be devised, without any play, and which did not wear, our troubles would cease and we would only have the difference in height of the rails, due to the wear of the rolls. This may amount to 3/64 of an inch.

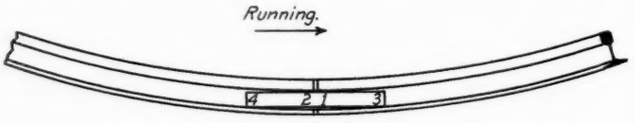


Fig. 13.

In case there is any play between the parts we will have the situation shown in Fig. 13. A plain fish plate is shown for clearness in drawing. When the load is equally divided the ends will be level, but with the load on the left side of the joint there will be an upward tendency on the right hand side due to the forward wheel passing far enough beyond the joint to cause a negative bending in the rail which will be enough to counterbalance the downward pressure at 3 transmitted by the fish plate itself. When the plate is badly worn we will have little pressure between the rail and the plate at either the top or bottom.

It must be borne in mind also that if the load is on the left of the joint that the downward pressure is greater than that transmitted through the fish plate to the right hand side, even under the best of circumstances. When there is a notch worn at 2 so that the rail bends under its load without producing very much pressure on the plate we will have the step up at its maximum.

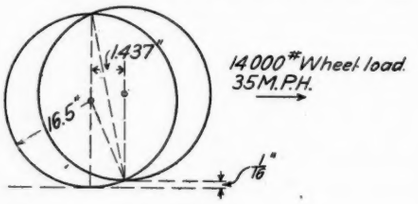


Fig. 14.

If we assume that there is 1/64 in. play and that two rails of the + and — inequalities (1/32 + 1/64) found in practice are all in conjunction, then the difference in elevation is 1/16 of an inch, and the wheel delivers a blow of considerable magnitude. If we use the method of Professor Moore, *Railway Age Gazette,* November 15, 1912, the horizontal component of the force will be 54,000 lbs. for the wheels of our heaviest cars, which will, however, be diminished, as the ends are rounded off with wear.

The conclusion we would come to in view of the foregoing figures is that the hammering on the ends of the rails is largely responsible for the creeping. It increases with the speed, load and flexibility of the rail. As the creeping due to wave action and to hammering of the ends is in the same direction it would be difficult to separate them without very careful measuring apparatus. One seldom realizes the force of creeping until he tries to stop it, and he then usually discovers that the first remedies applied are generally inadequate.

ABSTRACT OF ENGINEERING ARTICLES SINCE APRIL 18, 1913.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since April 18, 1913:

New D. L. & W. Line North of Scranton, Pa.—The Delaware, Lackawanna & Western has under construction a new three-track line between Clark's Summit, Pa., and Hallstead, 41 miles, which involves much heavy construction work and several large structures, one of which will be the largest concrete railway structure built up to this time. A comparison of the grades, curvature and other physical characteristics of the old and new lines was given in the issue of April 25, page 941.

New Delaware River Bridge of the P. & R.—The Philadelphia & Reading is now completing the construction of a double track concrete arch bridge 1,445 ft. long across the Delaware river near Yardley, Pa. The construction of this bridge and the contractor's plant layout are described and illustrated in detail by Edwin Chamberlain, assistant engineer, in the issue of April 25, page 944.

C. M. & St. P. Electrification Through the Rocky Mountains.—Further details of the electrification of the C. M. & St. P. between Harlowton, Mont., and Avery, Idaho, originally announced in the *Railway Age Gazette* of January 10, 1913, were given with a map and profile, in the issue of May 2, page 985.

Government Valuation of Railways.—The Interstate Commerce Commission has given out a statement outlining in a general way the manner in which this valuation work will be done. This announcement, together with the names of the five engineers appointed to form a commission in charge of this work, appears in the *Railway Age Gazette* of May 2, page 986. An editorial discussing the need for concerted action on the part of the railways in defining fundamental principles upon which this valuation should be made, was published in the same issue, page 978.

Weighing Methods on an Eastern Trunk Line.—The methods in use for installing, maintaining and operating track scales on a prominent eastern line were described in the *Railway Age Gazette* of May 2, page 992.

Weldon Viaduct Over the Roanoke River.—The Atlantic Coast Line has recently completed a large steel viaduct crossing the Roanoke river at Weldon, N. C. This viaduct was described and illustrated in the *Railway Age Gazette* of May 2, page 998.

New Freight Pier at Communipaw, N. J.—The Central R. R. of New Jersey completed last year a new covered freight pier for export business at Communipaw, N. J. This pier represents a modern type of construction for such structures and was described and illustrated in the issue of May 9, page 1023.

Erecting the St. Lawrence River Bridge.—In constructing a new bridge over the St. Lawrence river in the suburbs of Montreal, the Canadian Pacific erected two 408 ft. channel spans upon the adjacent approach spans and moved them into place by supporting one end upon barges and the other upon trucks moving on the approach spans. These spans were each moved into position in less than three hours total time, the net moving time being only 28.5 min. The method used to accomplish this was described and illustrated in the issue of May 9, page 1027.

Double Tracking on the Nashville, Chattanooga & St. Louis.—The N. C. & St. L. has been building second track north from Chattanooga during the past two years. This work has involved a number of interesting problems which, with their solutions, were described in the issue of May 9, page 1035.

A $50,000 Freight Platform.—The Studebaker Corporation has recently completed a loading platform for handling automobiles at Detroit. The interesting features of this platform and the methods of loading automobiles were described and illustrated in the issue of May 9, page 1038.

TIE RENEWALS AND BALLASTING.*

BY ENGINEER.

It is important that new ties should be put in the track as early in the season as possible, for this is certain to disturb the track more or less, and ample time should be allowed to ballast and surface the track so that it may become well settled before hot weather arrives and track gangs begin to shrink in size. At points where the rail is to be relaid this should be finished before the ties are renewed, tie renewal and surfacing gangs following as fast as the rail laying is finished.

On main lines with heavy and fast traffic ties should be renewed freely, and it may even be economical to take out ties which can be used again in second or third grade tracks, in order to insure perfect safety on heavy traffic lines. On side tracks and unimportant branches ties should not be renewed until their full life is insured.

Second-hand and smaller ties can be used to advantage in the little used tracks, while only the largest in size and the best in quality should be allowed on main lines.

A very wide field for economy is presented in the selection of the different qualities of ties and kinds of timber which can be used to advantage on the different portions of a large system. Different varieties of ties are most suited for use in the arid regions of the West, in the damp climate of the South and the cold winters and hot summers of the northern part of the country. Different kinds of timber and different methods of treatment are being studied by some roads in relation to their life and service in various localities. The tie map of the C. R. I. & P. described in the *Railway Age Gazette* of June 21, 1912, is a suggestion along this line. The selection and distribution of ties can be watched closely to advantage by all from general manager to section men. The heads of the maintenance departments should see that the allotment is properly made as to amount and kind. The superintendent and roadmaster should further distribute by quality and size to the various points needed, and the section man can also further differentiate to the various parts of the track, the best ties to the joints and softer places and the poorer to the places of lesser wear. On a large road this question is worthy of the sole attention of a competent man. On a system of 8,000 miles using an average of 300 ties per mile per year on renewals, the ties costing 80 cents each in the track, a saving of ten ties per mile per year would amount to a saving of $64,000, while an average increase of life one year by proper distribution of ties that are now lasting ten years would amount to an annual saving of $174,720. By proper supervision these amounts may be multiplied several times. For the year ending June 30, 1912, one western road spent $3,201,865 on the maintenance of 2,600 miles of track, of which $850,901, or over 26½ per cent., was for ties. This was at the rate of $327 per mile and is quoted to show the large relative cost of this one item of track maintenance, and the opportunity for saving by competent supervision instead of leaving the entire question to the section foreman or supervisor, as is done in so many cases.

The usual way of handling tie renewals is with regular section gangs to which extra men have been added. Light surfacing is also done in the same manner, while heavy surfacing and heavy ballasting is frequently done by extra gangs. The surfacing after rail renewal should follow the rail and tie surfacing gangs very closely in order that the rail may not be bent or damaged in any manner by the traffic before the track has been properly surfaced. There is a standing order on one Western road that tie spacing and surfacing shall follow rail laying within a mile.

Where there is plenty of good ballast under the track the surfacing should only be enough to take out the inequalities.

*The fourth of a series of articles on timely maintenance topics. The first appeared on page 351 of the issue of February 21, the second appeared on page 498 of the issue of March 14, and the third on page 905 of the issue of April 18.

The bed of the ties should not be disturbed more than enough to make an even bearing, as any unnecessary disturbance of the bed is injurious and requires time to restore it. Where more than the necessary amount of ballast is put in it is also a waste of money, for an inch of additional ballast per mile of track amounts to 163 cubic yards of ballast, costing on an average about 60 cents per cubic yard, or approximately $100 per mile. However, where ballast is thin or where there is poor ballast under the track, additional ballast should be put in. It is the custom to surface track by making a light raise of two to four inches. This method is advisable where there is some ballast, but where an additional thickness of ballast would be of advantage in distributing the loads over the roadbed. Where there is a new roadbed or track with little or no ballast under it, it becomes a question of adding the proper amount of ballast and making the amount of raise accordingly. Wherever it is necessary to put in over three or four inches of ballast the track should generally be surfaced more than once, as the higher the raise the harder it is for track men to bring the ties to an even bearing. The tamping is likely to be more or less uneven, and the roadbed may settle more in one place than another. Where a thick bed of ballast is put under the track some roads make the raise in several successive lifts of 3 or 4 inches each and some roads make the entire raise in one lift, using large and heavy jacks. This has been done with very good results even under heavy traffic. The main necessity is to keep a long and gradual run off well tamped where the raise begins. It is not as necessary to tamp ties solidly as it is to tamp them evenly, so that when they settle they will all settle alike.

Another reason which probably has rendered it customary to make a two to four-inch lift of the track every few years, is that the weight of rolling stock and the amount of traffic has increased gradually on most of our roads, and this method has added to the amount of ballast under the ties in a similar ratio. There is much track in the country which is not yet even reasonably ballasted, and there is very little track which has a fully adequate amount of ballast under it to properly distribute the weight to the roadbed, and to properly drain the water from the track. The proper thickness depends to a great extent on the quality and kind of material in the roadbed, as well as the quality and kind of ballast. A solid, well drained roadbed will not need nearly so much ballast as a soft, wet one.

The gangs for ballasting and surfacing need not necessarily be as large as those for laying rail. From 25 to 40 men with two foremen or one foreman and one assistant is ordinarily enough. With too many men in the gang or too many men under the control of each foreman the work can not be properly watched and track will not be raised as true to grade, nor the ties tamped as evenly. In rail laying gangs, native or hobo labor is ordinarily the best, while the surfacing gangs are frequently composed of foreigners. Where gangs are working near each other or at similar work, by creating a spirit of rivalry between the gangs or between different portions of the same gang, very good results may be obtained. The best way to do surfacing and ballasting is with ordinary section gangs. Additional men should be added to them until the extra work is finished.

As soon as the harvest begins and the hot weather is at hand it is hard to keep the forces up to normal. Consequently wisdom demands that the coming month be used to clear up all of this work as far as is possible to do so, and extra men should be employed so that as far as possible the only work left to be done after the first of July will be the regular maintenance work.

A RECORD OF MAXIMUM CLEARANCES.

By Jas. G. Wishart,

Chief Draftsman, Chicago, Rock Island & Pacific, Chicago.

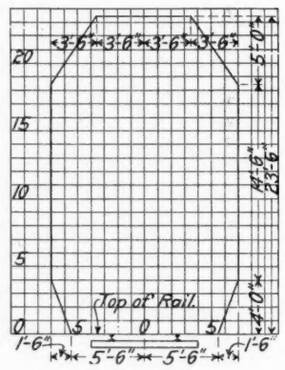
One of the most important records of a railroad, both from a safety and efficiency standpoint, is that of the minimum clearances on its lines. While most railroads make an effort to keep such a record, many of them are more or less unsatisfactory. While the data compiled may be accurate enough, it is in a great many cases put together in too general a form, making necessary reference to other records, and in cases where a doubt arises as to the clearance of a shipment, the reference of the matter to the division officers for a ruling, thus losing valuable time which may result in the loss of the business. The importance of having a strictly up-to-date clearance record, accurately compiled and in such shape that the route, destination and clearance of a shipment can be quickly and accurately ascertained, is realized on those roads where the acceptance or rejection of shipments of unusual or large dimensions is referred to the department keeping the clearance record, which is, of course, usually the engineering department. In addition to the fact that large and profitable shipments may be lost by railroads whose clearance records are not in such shape that a definite decision can be given in a short time, there may also be cases where shipments accepted on the basis of an improperly compiled clearance diagram, fail to clear some bridge or other structure along the line, and thus cause loss and damage to the railroad company's property, loss of life, inconvenience to the shipper and loss of future business due to the dissatisfaction of the shipper.

Fill out carefully all of the following.
Division.....Main or branch line.....
Mile post.....Bridge No.....Near (Town and State).....
Kind of structure.....Side of main track.....
Track: (Main-Ebd. or Wbd. or passing).....Tangent (Yes or no).....
Degree of curve.....Superelevation of curve.....
Estimated cost to change to standard clearance.....

Show in red on the diagram the outline of the clearance at point named above; using a separate blank for each obstruction and reporting only such as give less than seven feet clearance from the center of track.

Minimum vertical clearance to represent the minimum distance between top of rail and nearest point of any tunnel or structure above or across the track.

Minimum horizontal clearance must be shown at all points between the horizontal plane through the top of rail and the horizontal plane through the point of minimum vertical clearance. Attention must be called to cases where sidings or double track are placed less than 13 ft. c. to c. from main track.



Standard Blank for Recording Clearance of Each Obstruction.

A clearance record consisting of a series of tables and diagrams, shown in the accompanying illustrations, will fully meet all the requirements and will enable one to decide within a few minutes on the acceptance or rejection, as far as clearance is concerned, of shipments which may mean the gain or loss of hundreds of dollars in revenue to the company.

Blank forms similar to that shown should first be made up on tracing cloth and a supply of blue line prints sent to each engineer who is to perform the field work. Instructions should also be issued to them that every obstruction that comes within 7 ft. of the center of the track, measured horizontally, and every structure projecting over the track, is to be accurately

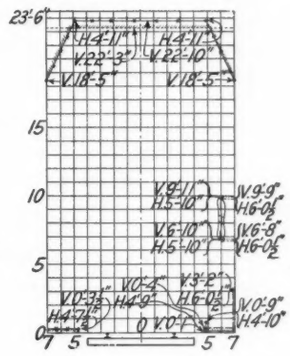
measured and platted on one of these blanks. A separate blank is to be used for each obstruction, all dimensions needed for its location being entered as well as a complete description as called for in the table at the upper right hand corner of the blank. The heavy solid line represents the standard clearance diagram, and can be shown simply to bring out at a glance any structure which does not conform to the standard. The dimensions shown are not intended to represent a recommended standard, but are simply those now in use on some roads.

The information when completed for a division and platted on the blanks is forwarded to the office of record, usually that of the chief engineer, where the permanent record is compiled. This permanent record is made up on tracing cloth, for blue printing, on sheets 11 in. long by 17 in. wide and bound in book form. The information from six or seven of the blanks returned from the field is platted on one sheet, a distinctive style of line being used for each obstruction shown on the sheet. A full description of each obstruction is also shown on the sheet, being arranged according to mile post location. The numbers in the column headed "Page," refer to the page carrying the diagrams covered by the figures in that line. At the bottom of the columns or at the end of each division, a summary is shown giving the minimum clearance over the entire division. In most cases the clearance of a shipment may be determined directly from the table. Where a doubt arises it is only necessary to turn to the page showing the obstructions on the section of line where the doubtful point is located, and from the description on that page a decision can readily be arrived at.

In compiling the permanent record it is especially important that the track alinement be entered correctly at each obstruction. This information is necessary when shipments of extraordinary length are offered, and they are routed over lines where obstructions are encountered on curves.

In order to keep this record up to date, it is necessary to have the hearty co-operation of the division forces. Blue prints of the diagrams for the respective divisions should be furnished to all operating and engineering officers. They should then be instructed to make special reports of any changes, in structures which affect the clearance record, to the office of record, which then revises the diagrams and tables and furnishes new prints to all concerned.

While this method of keeping a clearance record requires a great deal of time and expense in compiling, the benefits derived by being able to accept one large shipment, which otherwise might have been lost, will offset a large amount of the cost of the record. The time alone saved by the use of this form will in a short time more than pay for its compilation.



——————— Obstruction at M.P.302.8 Kent, Ia. Depot platform brick with concrete curb north side of main track. Track alignment tangent.
- - - - - - - - - - - - Obstruction at M.P.304.1 near Kent, Ia. Highway bridge overhead. Track alignment tangent.
——·——·—— Obstruction at M.P.308.7 Jacks, Ia. Mail crane. North side of main track. Track alignment tangent.
——··——··—— Obstruction at M.P. 313.9 Worth Ia. Mail crane. North side of main track. Track alignment 1°00' curve rail superelevation 2".
— — — — — Obstruction at M.P.313.9 Worth Ia. Depot platform. Brick. North side of main track. Track alignment tangent.
Note: Coal chute, north of passing track, 6'-10" from center of track M.P. 313.9 Track alignment tangent.
—×—×—×— Obstruction at M.P.315.1 near Worth Ia. Truss bridge over Skunk river. Track alignment tangent.
—‖—‖—‖— Obstruction at M.P.322.9 Lowe, Ia. Depot platform, brick with concrete curb. South side of main track. Track alignment tangent.

Note: Diagram shows all obstructions within 7 ft. of center of track. Where passing or other tracks are parallel and on 13 ft. ctrs, the maximum clearance line is fixed at 6½ ft. from center of track.

Typical Office Form Showing a Number of Obstructions.

Maximum widths at heights shown - heights above top of rail.

Div'n		Page	Top of Rail	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	23½	Max. Height	MW at M. Hgt.	Remarks
			ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	ft.in	
First.	Kansas City, Mo. to Term. Jct. Mo.	1	10-0	10-6	11-0	11-8	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1								17-5	12-1	2nd St. Viaduct & Trk. ctrs.
	Term. Jct. Mo. to Alex. Mo.	2	10-0	10-6	11-0	11-8	11-8	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10	12-10					20-1	12-10	Track Centers 12'10" & 13'5"
	Alex. Mo. to Norman Mo.	3	10-0	10-7	11-2	11-8	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	N.L.	13-0	No overhead obstructions
	*						*								*									*						*
	Lenox, Mo. to Sand, Mo.	7	9-0	10-8	11-2	11-8	11-8	13-0	13-0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	13-0			22-10	13-0	
	Sand, Mo. to Coal Chute, Kas.	8	10-2	10-10	11-8	"	"	11-8	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				20-6	13-0	
	Coal Chute, Kas. to Elk, Kas.	9	8-10	12-4	12-4	13-0	13-0	13-0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"				20-1	13-0	
	Max. clearance M.L. First Div.		8-10	10-6	11-0	11-8	11-8	11-8	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1	12-1								17-3	12-1	
Second.	Elk, Kas. to Summit, Kas.	15	9-4	10-2	10-8	11-3	11-8	11-8	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	N.L.	13-0	Bridge over Swamp River
	*						*								*									*						*
	York, Kas. to Key, Kas.	22	9-4	12-4	12-8	13-0	13-0	13-0	"	"	"	"	"	"	"	"	"	"	"	"	12-2	10-8	9-2					19-4	8-8	Bridge *60 & Tunnel
	Key, Kas. to Salvo, Neb.	23	8-8	13-0	13-0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	13-0	13-0						19-2	13-0	L.V.R.R. overhead
	*						*								*									*						*
	Park, S.D. to Lineville, N.D.	31	10-0	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	13-0	13-0				21-6½	13-0	
	Lineville, N.D. to Drake, N.D.	32	6-0	11-10	12-4	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	12-6	10-6	8-4				21-10	6-6	
	Drake, N.D. to Hilton, N.D.	33	10-0	10-7	11-0	11-6	11-11	12-2	"	"	"	"	"	"	"	"	"	"	"	12-10	10-2	7-5	4-9					20-6	3-4	Bridge over Camel Cr.
	Max. clearance M.L. 2nd Div.		6-0	10-2	10-8	11-3	11-8	11-8	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	11-0	8-9	6-6							17-9½	4-2	
Third.	Hunt, Ia. to Lowe, Ia.	56	9-3	13-0	13-0	13-0	13-0	13-0	"	"	"	"	"	"	"	"	"	"	13-0	13-0	13-0	13-0	12-5	11-6	10-6			22-3	10-4	
	Lowe, Ia. to Quarry, Ia.	57	9-4	"	"	"	"	"	"	"	"	"	"	"	"	"	12-5	10-6	8-8	6-10	4-10	4-10	4-4					20-10	4-4	Spout
	Quarry, Ia. to Plum, Ia.	58	9-4	"	"	"	"	"	"	"	"	"	"	"	"	"	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	N.L.	13-0	
	Plum, Ia. to Sand Pit, Ia.	59	9-4	11-9	12-5	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	10-10	9-0						21-11	7-2	
	*						*								*									*						*
	Tower, Ia. to High Bridge Ia.	66	9-2	10-4	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	12-3	11-3	10-3	9-4	8-4	6-8	6-8	6-8			22-5	6-8	Spout
	High Br. to Union Depot Ia.	67	11-2	11-2	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	12-0	11-6						19-9	9-8	Truss Bridge & Track Centers
	Max. clearance M.L. 3rd. Div.		8-4	10-4	"	"	"	"	"	"	"	"	"	"	"	"	"	10-6	8-8	6-10	4-10	4-10						19-0	4-10	

Note:-Dimensions shown are measurements from center of track & top of rail to obstructions.

Typical Maximum Clearance Table.

Two examples of these sheets are shown herewith, one for a single track road and the other for a double track road. The data from these sheets is then compiled in tabular form, as shown in the accompanying table, giving the minimum horizontal clearances at heights varying by one foot, from the top of rail to as high as it is thought advisable to carry them. These clearances are shown for consecutive sections of the line, the territory covered by a section being varied according to the number and distance apart of the obstructions. The

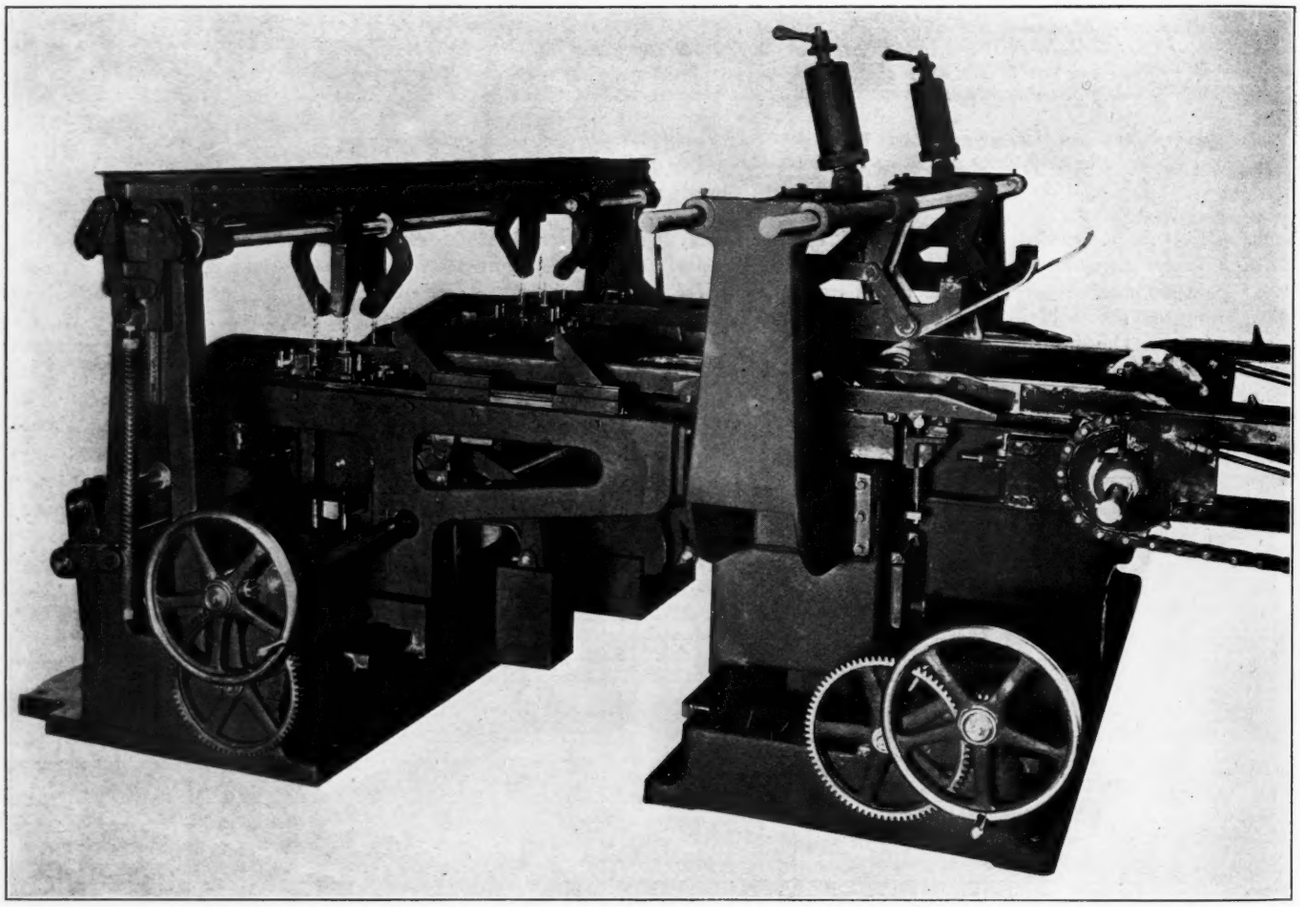
TIE ADZING AND BORING MACHINES.

The adzing and boring of ties before treatment has been practiced to quite an extent in Europe for some time, but it is only within the last two or three years that this subject has received serious attention in this country. With the greatly increased study which has been given recently to the protection of ties the inconsistency of spending from 25 to 50 per cent. of the first cost of a tie in injecting a preservative to increase its life, most of which is retained in the outer portions of the tie, and then cutting and mutilating it by adzing or driving spikes where the service demanded is most severe has become evident. This has brought about the development of machines to properly prepare the ties before they are treated.

The demand for a machine of this nature was the direct result of the application of screw spikes on a large scale, although it has now extended so far beyond this field of screw spikes that two-thirds of the ties adzed and bored before treatment last year were for use with cut spikes. When the Santa Fe first considered the extensive application of screw spikes it became evident that the boring of the ties by hand in the track was slow and expensive, and a machine was therefore devised to bore them before they were installed. The first machine for this purpose was brought out by Greenlee Brothers & Company, Rockford, Ill., late in 1910, and was installed at the Somerville treating plant of the Santa Fe in January, 1911. As it was thought at that time that it would probably be desirable to move this machine from place to place, it was mounted in a car. The second machine of this same type was built the same year for the Santa Fe, while others were built for the Northern Pacific and the Panama Railroad; the latter machine not being mounted on a car. Since that time additional machines have been built until nine are now in operation and almost an equal number will be installed this year. The latest machine completed is one which has just been shipped to the Delaware, Lackawanna & Western for installation in the treating plant at Paterson, N. J., and is shown in the accompanying photograph.

While the machines built in 1911 were made as compact as possible, so as to be placed on a car, it became evident that these machines would practically all be permanently located at treating plants. In later designs, therefore, the mounting in cars has been discontinued and they have been allowed to spread out more so that all parts are accessible for inspection and maintenance. They are mounted upon a concrete base covered with a wood block to absorb the shock and thus reduce the heating of the boring tools.

In delivering the ties to the machine they are spaced by means of dogs moving on the conveyor, as shown in the photograph, so that they are fed to the adzing knives at a uniform rate. They are then carried over the knives by other dogs.



New Combined Tie Adzing and Boring Machine.

An important improvement incorporated in the Lackawanna machine is an adjustable device for adzing irregularly hewn ties uniformly so that the finished surfaces are not only parallel, but the ties are adzed to a sufficient depth to provide full bearing for the rail, which was not necessarily the case when the knives moved in a rigid frame and the depth of cutting was limited by the high points of the ties.

The ties are carried from the adzing knives directly to the boring spindles—eight in number, which work upward. Another improvement in this machine permits the boring spindles to be inclined to enable spikes to be driven at an angle, as may be desired under certain conditions. Likewise, the spindles are adjustable for gage so that this may be varied if necessary. The bits may be readily replaced if broken, with a delay of but a few seconds.

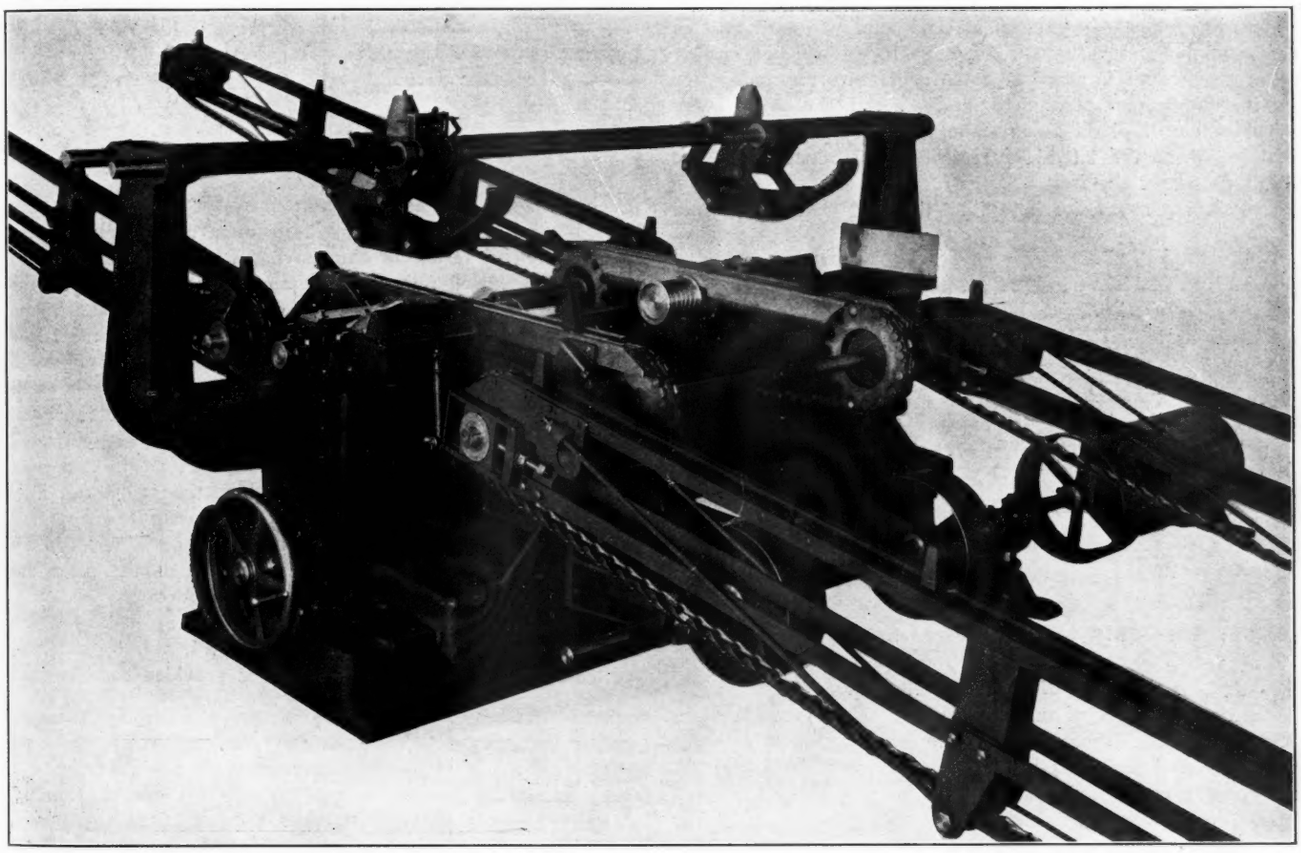
The ties pass from the boring spindles to a stamping unit,

not shown in the photograph, where any desired mark can be placed upon the ends by means of an air hammer. On the Lackawanna the weight of rail for which they are bored and whether hard or soft wood is marked, while at the Port Reading plant, owned jointly by the Philadelphia & Reading and the Central Railroad of New Jersey, the ownership and weight of rail is marked. All shavings and sawdust are collected in a pit under the machine and are withdrawn by air.

Another attachment first installed on a machine for the Philadelphia & Reading and since adopted on a new machine now being built for the Santa Fe, is the cutoff saws which are arranged to remove a small amount from the ends of the ties to detect unsound ties which show no surface defects and thus pass the inspectors. The experience gained from this first machine would indicate that these saws are a justifiable precaution. This attachment is mounted as a separate unit and is placed between the conveyor and the adzing knives.

All the various operations of the machine are synchronized so they act uniformly. The rate of operating depends directly upon the length of travel and the speed of rotation of the bits; the boring operation governing the speed of the entire machine. The Lackawanna machine is timed to pass 6.5 pine ties per min., harder woods, of course, reducing the output. The Santa Fe has passed as many as 4,200 ties through one of its machines in ten hours, although this is considerably above the average rate. A power plant generating 50 h. p. is required to operate this machine. If cutoff saws are installed, more power is required; 75 h. p. being used at Port Reading. The entire machine is under the control of one man; the only other labor required for its operation being that necessary to unload the ties from the tram onto the conveyor and to receive them onto trams after passing through the machine.

Where boring is not required, another machine has been designed by the same company, for adzing only, as shown in an accompanying photograph.



Independent Tie Adzing Machine.

THE IMPORTANCE OF DETAILS.*

By O. B. Cook,

Section Foreman, Chicago & North Western, Parkersburg, Ia.

It is a singular fact that since the "Safety First" movement has been inaugurated, the old things and the little things have been the ones that have claimed our attention. While we find the foreigners employed in track work today fairly intelligent, many section foremen choose the wrong methods to educate them and are often prejudiced and inclined to look upon them as "cattle," good only for what can be gotten out of them. We should first gain their confidence and respect, and then if we see a man do a careless or dangerous thing, it will be easy to correct it.

The proper use of tools and handling of material should be shown to them. It is not necessary to go into detail and enumerate the things that are dangerous to do, as we all know them. However, there is one thing of importance—the handling of hand cars—that deserves special emphasis. They should be kept in the best possible condition. A little shimming up of the wheels to make them run true and safely on the rail, the shimming up of a tight box or other sundry repairs will take less time than the making out of an accident report and will prevent many of these accidents. When several hand cars are used in extra gang work, it is almost impossible to keep the foreign laborers from overloading the best car, with the danger of one or more men falling off and getting killed or badly injured. I do not know of any better way to make section foremen see these things in the proper light than to have them attend the division safety committee meetings. This will broaden their views and will make them see some of the "little old" things with the dangers attached to them, that the section foreman would not think of otherwise.

*Received in the Safety contest which closed October 25, 1912.

GUARD RAIL DESIGN.

By F. W. Rizer,
Assistant Engineer, Chicago, Burlington & Quincy, Chicago.

Although many of our track appliances, as frogs, switches, crossings, switch stands, etc., have been improved from time to time to meet the requirements of heavier traffic and to obtain greater efficiency, so far as general practice is concerned, the guard rail remains as it was a number of years ago and the only improvements have been in the attachments that secure it in place.

The sole function of the turnout guard rail is to prevent wheel flanges from fouling the frog point when approaching it from the toe end. Slight variations in the gage and surface of the track cause a lateral movement of the trucks which increases as the speed of the train increases and wherever there is a break in the continuity of the rail, as at the frog point, a guard rail is necessary to insure the safe passage of the wheels over the break in the rail.

The average length of the main track turnout guard rails in service at the present time is about 15 ft., of which a certain length at each end is flared or at an angle with the main track and the middle part parallel to the main rail, the object being to guide the wheel flange into the flangeway as smoothly as possible, where the lateral movement is restrained while the wheels pass over the frog.

In designing a guard rail to fulfil the requirements it would

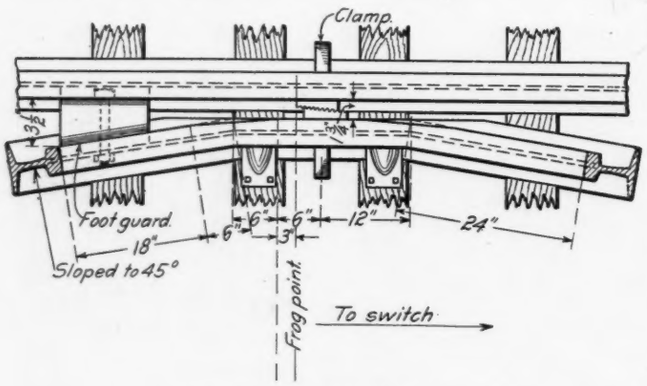


Fig. 1—A 6-ft. Guard Rail.

seem that, as the point of danger is at the frog point only, a few inches or a foot of rail parallel to the main rail, with diverging ends would accomplish the purpose as efficiently as the long guard rail and materially reduce the cost. The angle of the diverging ends should be small and may be determined from a series of practical tests or from the analogous case of the heel riser or raising rail used in frogs and crossings where there is a divergence in the vertical plane. The present practice is to plane these raising rails one-half inch in 6 or 10 in. The former gives an angle of 4 deg. 46 min., and the latter 2 deg. 52 min., and as these rails are subject to practically the same conditions as the guard rail, where the forces act in a horizontal plane the angle of the diverging ends of the guard rail may be established at about 4 deg. The end of the guard rail should be at such a distance from the gage side of the rail as will provide proper clearance for wheel flanges, considering the free movement in the journal boxes, and the wear and variations in the trucks and wheels. A distance of 3½ in., which is twice the width of the standard flangeway, provides ample clearance. Subtracting the flangeway (1¾ in.) from this distance and dividing the difference by the sine of 4 deg. gives a length of 25 in. for the diverging end, or the length may be established at 2 ft., making the angle 4 deg. 11 min.

A further easement in the diverging end may be effected by planing off the side of the rail head for 6 in. on each side of the bent point as shown in Fig. 1. This shows a short guard rail as described above. It will be noticed that the ends, instead of being vertical, make an angle of 45 deg. with the horizontal, to prevent dragging brake rigging or other parts from fouling on them. This is an important feature and should be included in specifications, especially as the additional cost would be but a few cents.

It has been the practice for many years to secure the guard rail in proper position by two or more cast iron blocks placed between the webs of the main and guard rails. Bolts extending through both webs and the block hold the guard rail in position and rail braces of various design are applied against the outer surface of the guard rail to resist the thrust of the wheel flanges. There are two defects in the above arrangement: first, as the inside surface of the guard rail head is worn away, the width of the flangeway increases and no means is provided by

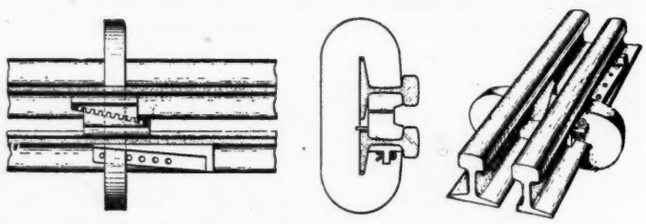


Fig. 2—An Adjustable Guard Rail Clamp.

which the wear may be compensated, except where a two-way block is used in which case one adjustment may be made; second, the lateral thrust of the moving wheel flanges tends to overturn the guard rail, and in a short time results in an increase in the width of the flangeway. Several arrangements of plates and braces have been designed to eliminate the latter defect with but partial success. There is a device known as a guard rail clamp which reduces the defects mentioned above to a minimum. This device has been used extensively in the East, where it has given good service. It comprises a heavy forged or cast steel yoke formed to fit the contour of the rails, a two-piece adjustable block by means of which the guard rail may be brought nearer the main rail to compensate for wear, or the flangeway may be increased when the gage is widened on curves, and a wedge shaped piece which holds the parts securely together. Fig. 2 shows this device in detail.

Rail braces of approved design should be applied near the bends in the guard rail as shown in Fig. 1, and by shearing the flange of the guard rail clearance is provided so that both

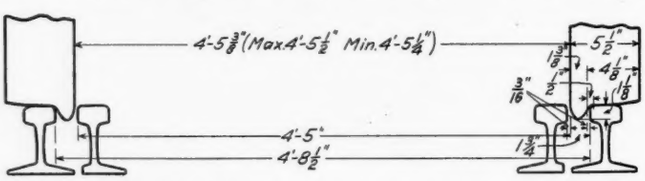


Fig. 3—Standard Guard Rail Spacing of Master Car Builders' Association.

rails may be spiked. When it is necessary to adjust the guard rail on account of wear, tie plugs should be inserted in the old spike holes and the spikes redriven.

Opinion varies as to the use of foot guards. Most of the designs now in service, both metal and wood, are satisfactory, but it is essential that the foot guard be attached to the guard rail in the shop so that when the guard rail is installed no connection with the main line rail is necessary to hold the foot guard in place. The foot guard shown in Fig. 1 is a solid hard wood block.

The details described above cover the essential features of an efficient guard rail, and although to many the short length may seem radical, there are others who think that in the long guard rail there are several feet of rail from which no service is obtained. Some trackmen may contend that a short guard rail

would not be safe if placed opposite a main line spring frog on account of the movement of the spring rail, which is held in proper position by a spring. This rail is free to move outward a maximum distance of 1¾ in. at the frog point, the movement decreasing toward the toe end of the frog where there is no movement. However, as stated above, the real point of danger is at the frog point and should the spring rail open, the short guard rail would arrest the excess lateral movement before the flanges could foul the frog point, which is all that is desired.

In connection with the installation of guard rails there are two details which must be observed: the main rails must be spiked to proper gage, 4 ft. 8½ in. for tangents, and increased when the curvature is sharper than 3 or 4 deg.; and the gage of the guard rails must in all cases be 4 ft. 5 in. This dimension never varies. If the track gage is 4 ft. 8¾ in., the width of the flangeways is one-half the difference of 4 ft. 8¾ in., and 4 ft. 5 in., or 1⅞ in. The following table shows the correct flangeway for track gages from 4 ft. 8½ in. to 4 ft. 9½ in:

Gage of track.	Width of flangeway.	Guard rail gage.
4 ft. 8½ in.	1¾ in.	4 ft. 5 in.
4 ft. 8⅝ in.	1 13/16 in.	4 ft. 5 in.
4 ft. 8¾ in.	1⅞ in.	4 ft. 5 in.
4 ft. 8⅞ in.	1 15/16 in.	4 ft. 5 in.
4 ft. 9 in.	2 in.	4 ft. 5 in.
4 ft. 9⅛ in.	2 1/16 in.	4 ft. 5 in.
4 ft. 9¼ in.	2⅛ in.	4 ft. 5 in.
4 ft. 9⅜ in.	2 3/16 in.	4 ft. 5 in.
4 ft. 9½ in.	2¼ in.	4 ft. 5 in.

This guard rail gage of 4 ft. 5 in. has been established by the Master Car Builders' Association, and as the clearance and distance between wheel flanges is based on 4 ft. 5 in., it is important that the guard rail gage be maintained at this distance. Fig. 3 is an elevation showing the M. C. B. standard car wheel and the relative position of the guard rails.

SAFETY FIRST.*

BY RICHARD BROOKE,
Assistant Division Engineer, Baltimore & Ohio, Pittsburgh, Pa.

In dealing with the "safety" problem in the maintenance of way department it must be remembered that the majority of the men in this department, the track laborers, are of a lower grade of intelligence than those of any other department of the railroad, and it is, therefore, more difficult to make each individual undertsand the importance of the movement and to get him interested. A large percentage of fatalities are caused by trains or engines striking men who are standing, walking or working on the track and in a great many cases, where there are two or more tracks, the men get out of the way of one train and step in front of another coming from the opposite direction. Quite a number of men are also killed or injured by trains striking the hand cars or the motor cars on which the men are riding.

To avoid accidents of this kind and any injuries that are liable to result from tools that are not in proper condition, material handled carelessly, etc., the men, if possible, and especially the foreman and assistant foremen, must be made to understand that the company is trying with the co-operation of each individual to do everything possible for their personal safety. This can be accomplished largely through the influence of the supervisors and foremen.

Supervisors should call meetings of their foremen and assistant foremen and try to impress on them the importance of "Safety First" and what they can do to promote it. They should understand that they are, to a certain extent, responsible for the safety of their men, and that in most cases, accidents can be avoided if the safety rules of the company are strictly enforced and by careful vigilance on their part. If dangerous conditions exist on their sections, they should be reported to the division safety committee, with suggestions as to how they can be remedied.

In case of an accident on the division the supervisor should make a thorough investigation and post bulletins at all tool houses, outlining the cause and how it could have been avoided. The fact that a supervisor and section foreman are on the safety committee will add greatly to the interest taken by the men.

*Received in the Safety contest which closed October 25, 1913.

A WELL EQUIPPED BOARDING CAMP.

In the reconstruction of the clearing yard near Chicago, plans for which were described in the *Railway Age Gazette* of March 21, about 400 "hobos" are employed in track gangs. In addition to the good rate of pay which is offered and the fact that the work is located near Chicago, one of the most important factors in securing and holding a good grade of native labor is the treatment which the men receive in the camp. This is all the more important this year because of the large amount of work under way. The Chicago & Western Indiana in conjunction with the Consolidated Boarding & Supply Company, Chicago, which has the contract for boarding the men, have given careful attention to the equipment and management of the camp.

The railway company furnished the cars necessary for the

View in Laborers' Dining Car.

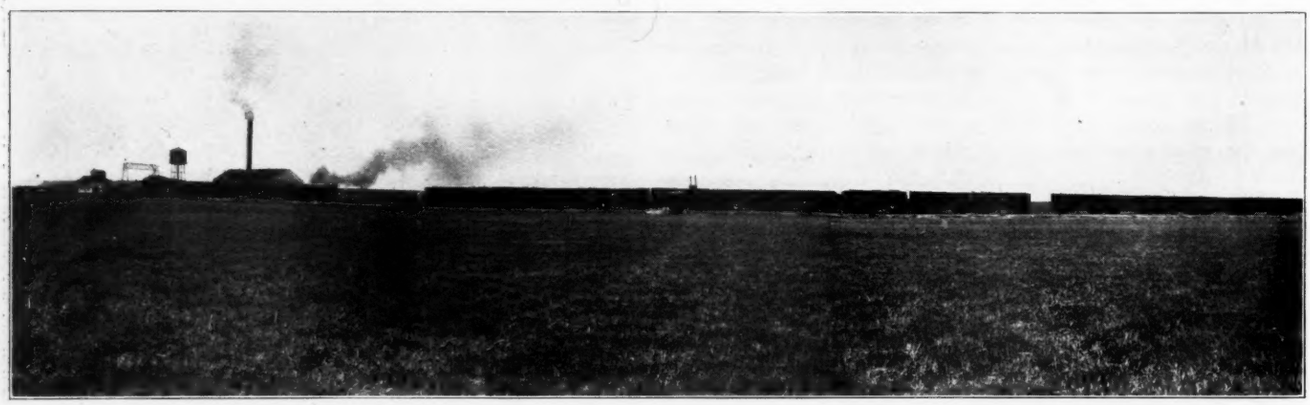
camp, remodeling them from old refrigerator cars for this job. They were sealed, covered with a new roof of tar paper, and painted inside and out. Each camp provides for 200 men and foremen. There are 23 cars in a camp; 12 bunk cars, six diners, one store, one commissary, one kitchen, one foremen's diner and one foremen's bunk. The general arrangement of the camp is shown in the accompanying panorama. All the cars, with the exception of the two foremen's cars are on one track, being divided into three groups as a precaution in case of fire. The bunk cars are separated into two groups of six each, located at the ends of the string. The row of six diners is divided in the middle by the kitchen car, the company and store cars completing the center group of nine. The foremen's diner is directly opposite the kitchen car on an adjacent track, and is

reached by a gangway between the doors. The foremen's bunk car adjoins this diner.

The bunk cars are each equipped with 16 bunks, fitted with a straw tick, a pair of blankets and a pillow covered with a colored slip. The cars have side doors and six windows, two in each side and one in each end. Provision is made for the men to wash in all of the bunk cars. The foremen's bunk car is fitted with steel bunks and iron beds, having a capacity of about 10 men. One man is employed to care for all of the bunk cars.

Each dining car seats 33 men, the appearance of the interior of one of these cars being shown in one of the accompanying illustrations. The table is covered with white oil cloth. Heavy hotel chinaware is used with the single exception of the soup bowls, which are of white graniteware. The kitchen car is 33 ft. long and has two large ranges, having a total length of about 11 ft. These are equipped with all the necessary cooking utensils. The car is manned by a cook, a second cook and a pot washer. A flunky is provided for each dining car to set the tables and place the food on the table. The store car is provided with a refrigerator holding one ton of ice and a large supply of meat. The commissary car is in charge of a clerk who has supervision of the entire camp. The charges for these commissary supplies as well as for board are handled through the railway company, the commissary clerk having access to the timekeeper's books at frequent intervals for checking his payroll.

The food served the men is of good quality throughout. Meats are secured directly from a packing house and are shipped two



View of Boarding Camp—Bunk Cars at Each End and Dining Cars in Center.

or three times a week so as to insure a fresh supply at all times. Beef, pork, mutton, sausage and bacon are the staple meats; eggs being provided on Friday, and roast pork and dressing for Sunday dinner. All kinds of vegetables are provided in season and all kinds of canned goods are kept in stock. A baker is employed who works at nights baking all the bread, cakes, cookies and pies that are needed. Either pie, cake or pudding is provided for every dinner and supper. The foremen's dining car is supplied with practically the same food that the men receive, the principal difference being in the service. In addition to the 10 foremen who are boarded here continually, about 30 men from the railway company's office at Clearing are fed at noons in this foremen's car. In the laborer's dining cars the meat is put on the table on big platters and the vegetables in large dishes. The men help themselves as often as they like, the dishes being refilled when they are empty. The camp requires about one ton of meat and 2,500 lbs. of potatoes a week. The daily requirement of sugar is about 100 lbs., and of flour close to one barrel. The water supply for drinking and cooking purposes is secured from artesian wells alongside the camp.

This camp is under the general supervision of M. D. Crawley, general manager of the Consolidated Boarding & Supply Company, to whom we are indebted for courtesies in securing this information.

CONSERVING LIVE STOCK.

J. C. Nelson, engineer maintenance of way of the Seaboard Air Line Railway, writes to the *Wall Street Journal:*

"During the period of harsh criticism and strict government regulation, smiles appear seldom on the average railroad man's face and laughs are still more infrequent. However, we do once in a while run up against something that will bring these results and as an illustration, I attach herewith a verbatim copy of a letter received a few days ago. I may add that we have as yet reached no decision as to this proposition. We are holding the papers hoping that a time may come some day when we can reach a decision which will be equitable and just to all concerned."

The letter follows:

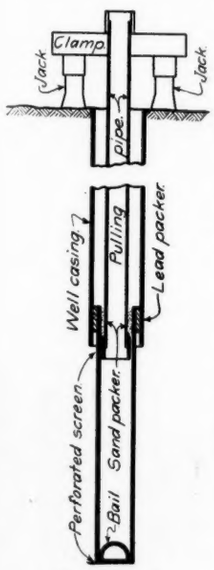
"I wish you would have the culbert cut two feet deepr so my ditch will have moare fall so it will wash out the san and it wont stop in ditch. I hase the ditch most finished so it will do the work O. K. and I will be ready for a settle and will give bond for it to stay fix for year or longer and I want to make a trade with you to make a rat trap that will catch all the rats on your division. I will do this with you, send the rats to you ded or live ten cts each and will take it in passes for my family & self and as long as thare is any rats to be caught you give me a milage pass and charge it to the rat acct, and if any of us rides any more than the rat acct pays for will get ticket or you give me a pass on your division and the hides of all the stocks that the R. R. kills and when only one or two legs are broken I will by them give ½ price or will deliver them to Richland. I could fix a light thing to load a cow on a trane in 5 minutes and if trane should cut a young mars foot off only one I would by her then to rase mules with. Thare is thousand of stock killed that the trane hit, no need of it. I hase saved severald that had thare leg broke. Last Monday I was at Charles and they had a cow that the trane had broke one of her legs and about 2 inch of the bone was sticking out. The foman sayed he was going to have her killed. I told him to take the cow at 250 cts & I would fix the leg O K and pay for the feed if cow dyed and if live he pay me for my surgical opperation. I sawed two inched of the bone off and put the other bone in and I think in a few weeks the cow will be O K and lots of time it would save the Sixion foman ½ day work going seeing after the cows that is killed & when I skin one I will drag it off the rightoway and the busards will eat it up before it begin to smell bad much and that will save the Foman of buyin stock—and if you will have the suer that covered up in san doing no good dug up and put under the R. R. to controle the water that comes down on the left of the St going up town that would stop all the rane from runing in track and having so much slop, the ditch I cut controles all the water that comes down on other side. let me no what day you will come and I will meet you."

"SANDING IN" WELL SCREENS, CASING AND PIPES.

By L. J. Putnam,
Division Engineer, Chicago & North Western, Boone, Ia.

The railways as well as many of the smaller towns and cities throughout Iowa and the neighboring states depend for their water supply on cased wells from 60 to 200 ft. deep. The water-bearing material encountered lies usually immediately over rock which is in all cases limestone. Resort to these shallow wells is had on account of the water being much better for boiler use than the deeper artesian waters encountered below or in the limestone. The well used by the Chicago and North Western, and very generally by other roads and cities is a drilled well cased with 12 in. butt jointed, steel drive casing with a tubular brass screen about 30 ft. long at the bottom. These large dimension screens cost about $350 each, and the well casing costs about $1.60 per ft.

These wells are of short life, as there is a gradual choking up, not so much from clogging of the screen as from the gradual drawing in around the screen of fine material which shuts off the flow of water to a large extent and makes it necessary to sink other wells. From one to four years is about the range in life of wells of this character. When new wells are put down the casing is necessarily sunk to the bottom of the water bearing vein. The screen is then lowered and the casing is jacked up slightly less than the length of the screen, so as to bare the screen for the whole of its perforated length. After this operation, the top of the screen, which is provided with a lead packing ring, is swaged out with a special tool to seal the top of the screen against the casing. For a larger portion of the distance sunk the material encountered is clay which develops a very high skin friction on the casing, making it very difficult to withdraw the casing to bare the screen, and frequently it is necessary to pull the casing partially from the inside near the bottom to relieve the strain on the threaded joints occasioned by outside top pulling, and thus prevent pulling the casing in two and losing the screen, the casing and the labor expended.



Method of "Sanding in" Well Casings.

The withdrawal of the casing to bare the screen as well as the removal for re-use of the casing and screen is a problem which has been very successfully solved by what is locally termed "sanding in" of an inside pulling arrangement. Where the pulling of the casing for uncovering the screen develops more of a strain than the threaded joints will safely bear a 10 in. casing is firmly coupled up and lowered into the well. The lower end of this inside casing bears an ordinary coupling, or if the coupling does not fit the outer casing closely, a special coupling is provided so that it forms a close, but not a driving fit inside the 12 in. casing. This special coupling is lowered to about one-half the depth of the well and "sanded in," which consists simply in dropping a shovelful of sand between the inner and outer casing. Jacks can now be applied to the inner casing as well as the outer, only as much strain being put on the top of the outer casing as it can safely stand. The first strain of the jacks on the inner casing produces a wedging effect in the "sand packer" between the inner and outer casing and clamps the two firmly together. When the casing has been withdrawn sufficiently, a few turns of the inner casing after dropping it a little to loosen the sand will cause the sand to sift through, freeing the inner casing for removal. If the pulling strain is too great for the combined strength of the two casings, a rod can be inserted to engage the bottom of the inner casing and other jacks used on this.

In the case of removal of screens and casings, the method of procedure is obvious. The brass screens as furnished by the factory usually have a bail at the bottom, intended for use in lowering the screen. Our practice is to take this out entirely and close the bottom with a shovelful of cement mortar after the screen is in. The dropping of cylinders, drop pipes, or rods into wells during the operation of placing pumps is not an infrequent occurrence. With concrete bottom, no harm is done; while with the factory made bottom a weight dropped on it is apt to lower the screen so as to pull it down below the casing, resulting usually in complete loss of screen and well. If the screen is not lowered by such an accident, the chances are that it will be pulled in two with the same net result—loss of screen and well. Even if the factory made bottom were free from this objection, the bail would be useless for removing the screen from an abandoned well for two reasons: first, it would be covered with fine sand during the operation of the well and second, if not so covered, a strain on it sufficient to slip the top lead packer in the casing would collapse the screen, which is too fragile for such strains. Our method is to "sand in" a coupling as above described at the top of the screen, where it is solid. No trouble is then experienced in pulling the screen without damage to it. After the screen is removed, if the casing starts unduly hard, an innner casing is sanded in near the bottom and both casings removed together.

The above method is in general use by us with the best success. The pulling is necessarily slow for part of the distance, but we have just recovered for re-use material worth $600 by an outlay of $50 for labor, an instance of what can usually be expected. Aside from the saving of material from abandoned wells, this method makes it possible to raise casings to bare screens when skin friction is so great that wells of this nature would be impossible without this expedient.

The same method might be successfully used in other than well work, as for instance anchoring guy wires or lines to holes drilled in rock where a temporary arrangement easily removed is desired. In fact the ordinary reader will recall many places where such a method can be used to great advantage. The accompanying cuts illustrates the application to the removal of a well screen.

"SAFETY" RECOMMENDATIONS.

In the report of the general safety committee of the Chicago & North Western for the years 1911 and 1912, just issued, figures are given showing that during the two years ending December 31, 1912, 10 fewer track men and two fewer bridge men were killed and 927 fewer track men and 141 fewer bridge men were injured than in the two years immediately preceding. The report also contains a large number of general recommendations made by the local safety committees and approved by the central safety committee, of which the following are of interest to maintenance of way men:

Foremen of extra gangs should be provided with a whistle to notify men to get off the track when trains are approaching.

Gearing of hand cars should have shields over them.

Instructions should be issued to stop the practice of burning ties on right of way near bridges.

The use of guy wires on top of outfit cars provided with stoves should be prohibited and standard way car jacks ordered to be used instead.

Gas pipes should be adopted for use of handles on hand cars instead of wooden handles.

Bunk cars occupied by B. & B. and track forces should be protected at night by blue lights and during the day by blue flags, placed one on each side of the car and at diagonal corners.

All gasolene hand cars should be covered so there will be no

danger of anybody getting hurt by the engine while it is in motion.

Wherever possible loading of scrap iron in stock cars should be avoided.

Flagmen of section or extra gangs should be provided with torpedoes in addition to a flag.

Division superintendents should issue instructions prohibiting section men from going under cars when it rains or for any other reason.

Before bunk cars are moved, the side steps should be removed and placed inside of the car.

FLOOD RECONSTRUCTION ON THE PITTSBURGH & LAKE ERIE.

The Pittsburgh & Lake Erie suffered an actual damage to track and structures of about $100,000 as a result of the flood of March 26. The Beaver and Mahoning rivers rose to a height five feet greater than previously known, cutting off railway communication on all lines. In spite of the amount of damage done, through business on this line was restored with an interruption of only four days. That the delay was so small was due in a large measure to the completeness of the organization immediately improvised to handle the work.

As soon as the flood arrived, all machinery including wrecking outfits and pile drivers was gotten under steam. Forces were divided into day and night shifts so arranged that no person would work over 16 hours, and were maintained in this manner for 10 days until the damage was practically repaired, although both freight and passenger traffic were resumed within 36 hours after the water had left the rails. During the first 24 hours after the line was opened, even though only single track was in service at several points, 38 freight trains of coal, coke and general merchandise were handled.

Picking 500 Ft. of Track out of the River with a Wrecking Outfit.

One interesting method used in this emergency work is that illustrated in the accompanying photograph. Between Fallston and Beaver Falls the current in the Beaver river was so great as to wash out the embankment under both main tracks. Before the track next to the hill was entirely undermined it was shifted further into the hill onto a solid embankment. The track on the river side was completely undermined and 500 ft. of it went into the river. A wrecking train working on the track next to the bank succeeded in lifting this second track out of the river and pulling it onto a solid embankment at a cost of about $100, as compared with fully $500 to save the track in any other way. If the wrecker had not been utilized it would have been necessary to tear the track apart, and if this had been done some of the ties and rails would have been lost, while with the method adopted, no material of any kind was lost. We are indebted to E. F. Wendt, assistant engineer, for the photograph and information.

THE FOREMAN PROBLEM.*

By F. H. Carpenter,
Roadmaster, Atchison, Topeka & Santa Fe, Hutchinson, Kan.

The question of a supply of section foremen is simply a matter of dollars and cents. The wages paid are not attractive enough to hold the best foremen, or to induce young men to learn track work with the view of becoming foremen. The following methods are suggested for training young men for these positions:

First. Allow the roadmaster to pay a graduated scale of wages to a few men, placing them with the best foremen.

Second. Pay section laborers the prevailing scale of wages paid by other employers.

Third. Organize classes under competent men to work as extra gangs, with a graduated wage scale.

If the roadmaster should be permitted to hire a few bright, energetic young fellows and place them with his best foremen, at wages beginning at, say, $1.25 a day and increasing, at intervals of a few months, up to $1.75, he could rely upon these apprentices being taught to do the work as he wants it done, but a man who understands the work and is a good hand sometimes makes a poor foreman. This could be discovered by giving him a tryout even before he has worked long enough to be considered competent for a section.

The prospects are poor for making good section foremen of the Mexicans with whom we have been furnished during the last five or six years. They are incompetent and after they have worked about six or eight months they want to go home, and that is the last of them. The natives that we are able to hire for $1.25 a day, are, with very few exceptions, a shiftless and incompetent class of men, and are poor material from which to draw foremen.

I am also in favor of paying the wages for track labor paid by other employers of labor, about $1.75 a day. This would give us plenty of good material from which to select, and a class of men that would do more work than an equal number of foreigners, but I doubt very much if any western road, under present conditions, would feel justified in raising the wages of so large a class of men. It is more important, however, to have a good class of foremen than to have a good class of laborers, and a dollar invested in foremen will bring better results than one invested in laborers.

The third method is objectionable on the ground that men working in extra gangs do not learn the real business of maintaining track. Their work has more to do with construction than maintenance. They would probably be a division gang, not under the control of any one roadmaster. The place to learn the duties of a section foreman is on a section with a good foreman.

*Received in the contest on The Foreman Problem, which closed March 25, 1912.

General News.

The Boston & Maine has discontinued a number of passenger trains on the Fitchburg and the Southern divisions and has discharged some of the men in the engineering and bridge departments.

The federal grand jury at Chicago has returned an indictment against the Illinois Central charging that the road permitted the shipment of cattle out of quarantined areas in Mississippi in 1912 without properly designating the character of the shipment, in violation of the rules of the Department of Agriculture.

The Lehigh Valley now has telephones in use for train despatching throughout the whole of its lines. The company expects to follow this improvement with the installation of telephone wires for messages where necessary, and the officers are looking forward to the time when telegraph instruments will be thrown out of use entirely.

Harry T. Wilkins, formerly chief clerk in the office of Theodore N. Ely, has been appointed Special Agent of the Traffic Department of the Pennsylvania Railroad, with office in Broad Street Station, Philadelphia, to take charge of the preparation, installation and display of the Pennsylvania's exhibit at the Panama-Pacific Exposition to be held in San Francisco in 1915.

Thirteen complaints alleging violations of the law regulating the transportation of livestock were filed in the United States district court at Chicago on May 6, against the Chicago, Rock Island & Pacific; three against the Chicago & North Western; one against the Illinois Central; three against the Chicago, Milwaukee & St. Paul; one against the Pere Marquette; one against the Wabash; and three against the Chicago, Burlington & Quincy.

The committee on territories of the Lower House of Congress is preparing to report a bill providing for the construction of government railroads in Alaska, in accordance with the general plan which was laid before Congress some months since by President Taft. The committee has held a number of hearings and has taken testimony of representatives of commercial interests in Alaska, both for and against the construction of railroads by the government.

The "Katy Office Efficiency Association" is to be organized on the Missouri, Kansas & Texas at a meeting on May 22, for the purpose of studying and discussing subjects that pertain to the efficiency of office work on the system. Membership in the new organization will consist of the chief clerk, assistant chief clerk, accountants and timekeepers in the office of each division superintendent, the chief clerk, assistant chief clerk, accountant and chief timekeeper in the office of the superintendent of motive power, assistant superintendent of motive power and master car builders, traveling and division storekeeper and chief clerk to the general storekeeper and chief clerks, assistant chief clerks and heads of all departments in the general office at Dallas, Denison, Parsons and St. Louis.

The Boston & Maine announces that its new direct route from Boston to Springfield, about the same length as the parallel Boston & Albany, will be opened for business June 23. This route is made possible by the construction of the Hampden Railroad from Bondville, Mass., to Springfield, 16 miles, the work on which has just been finished. President Mellen, answering, before the Interstate Commerce Commission, at Boston, the criticisms alleging extravagance in making the large expenditures necessary to build the Hampden Railroad, said that he expected the new link would furnish enough additional traffic for the Central Massachusetts division of the road to make that division a paying property. On June 23 also, the Boston & Maine will put in use its new line from South Vernon, Vt., northward, 11 miles, to Brattleboro, on the New Hampshire side of the Connecticut river. With this length completed the Boston & Maine can run trains on its own rails from Springfield, Mass., northward to Windsor, Vt., and the New York-White Mountain trains will use Central Vermont tracks only from Windsor to White River Junction, 14 miles.

Unfilled Tonnage of the Steel Corporation.

The report of the United States Steel Corporation shows that the unfilled tonnage on April 30 was 6,978,762 tons, compared with 7,468,956 tons at the end of the previous month, a decrease of 490,194 tons. It had been estimated that the decrease would not exceed 300,000 tons. The figures show that during April orders were booked at the rate of 7,860,000 tons a year, comparing with shipments at the rate of approximately 13,500,000 tons a year. The unfilled tonnage on the books of the Steel Corporation is now smaller than it has been since October 31, 1912, when it was 7,594,381 tons. The shrinkage in April of this year was the largest reported in any month since June, 1910, when it was 1,145,000 tons.

Substitute for the Car Repairers' Blue Flag.

The railway commissioners of Canada, following an investigation of certain complaints, have recommended to the railways of the Dominion that a metal or wooden disk be used as a signal for the protection of cars which are being repaired, instead of the flag, which is "subject to the caprices of the wind." The commissioners recommend the use of a disk the shape of a semaphore arm, to be hung on the ladder at the end of a car and so fixed as to project 18 inches out beyond the side of the car. In this position it would be visible the length of an ordinary train. The horizontal arm would be fastened to a short vertical board, fitted with hooks by which it could be supported on the rounds of the ladder. At night a blue lantern could be hung from the projecting arm. The railways are requested to send to the commission their views on this suggestion.

Soo Line Co-operative Association.

As noted in last week's issue, the Minneapolis, St. Paul & Sault Ste. Marie is organizing an association to be known as the Soo Line Co-operative Club, or Association, for the purpose of providing a means for the investment of small savings by the employees, as well as to promote interest in the welfare of the company. It is proposed to incorporate the association and to issue shares of $1 each. Any employee who has been in the company's service for six months will be eligible, and may acquire one share; the $1 to be repaid to him in case he leaves the company's service. Employees are asked to sign a card addressed to the comptroller, giving authority to pay into the treasury of the association for his account the $1 for membership stock certificate, and a certain sum each month, to be deducted from his wages. The small savings of the many employees as they come to the club's treasurer, are to be invested in securities of the Soo Line or subsidiary companies. At the end of each year the earnings from the investment will be distributed so that each member should begin at the end of the first year to receive a small income from whatever amount he shall have saved during the year. Already a considerable number of employees have signed the membership cards.

Illinois Central Employees Ask to Aid Company.

Officers of the Illinois Central were greatly surprised last week to receive a communication signed by a large number of clerks, engineers, conductors and other employees, requesting that they be permitted to give one or more days' pay to aid the company in making repairs rendered necessary by the recent floods in the South. The employees also sought permission to solicit contributions from all employees on the payroll of the company by means of the following statement: "We feel as railroad employees that we should deeply deplore these unfortunate conditions, and to the end that the Illinois Central may have our assistance, co-operation and support in rebuilding and repairing its bridges, track and equipment, we hereby appeal to you to join us in the contribution of the equivalent of one or more days' pay to that end."

In declining the offer Vice-President W. L. Park said, in part: "In all my railroad experience, in the ranks and as an officer, I never have encountered so unselfish and loyal an offer. That these men should voluntarily tender their mite to assist their company (and I use the word 'their' advisedly, for such men are really partners in the institution) is an evidence of such patriotic loyalty and self-abnegation that I am inclined to the belief that it is unparalleled in railroad history."

Death of John Saxby.

There has just died at Hayward Heath, forty miles south of London, an Englishman whose name is known to railroad men throughout the United States; John Saxby, of the firm of Saxby & Farmer. He died, at the age of 92, on Wednesday, April 23, and his portrait was printed in the *Railway Gazette* (London) of May 2. The first patent bearing Saxby's name was taken out in 1854, for a signal lamp with a movable inner case which changed the color of the light as the signal arm moved up or down. This was the joint invention of Saxby and W. V. Greenwood. Saxby's first interlocking patent—the invention which has made his name a household word among signal men all over the world—was taken out in June, 1856. His first installation was an interlocking of eight signals and six switches at Bricklayers' Arms Junction where, fifteen years before, the semaphore designed by Gregory had been first introduced. In 1860, Austin Chambers patented an improvement on Saxby's idea, but a few months later Saxby made still further improvements, and thereafter kept the lead over all his competitors. His patent for preliminary latch locking was taken out in March, 1867. The firm of Saxby & Farmer was established about 1860. Both of the partners had been connected with the London, Brighton & South Coast Railway. Mr. Saxby for many years lived in France attending to the continental business of his firm.

Prompt Settlement of Freight Claims.

J. H. Reich, superintendent of car service of the Frisco lines in Texas, has issued an order having for its object the satisfaction of patrons by speedy payment of their claims and obviating much red tape. New rules, just issued to agents, contain the following provisions:

"Agents at all stations are authorized to pay by draft claims for visible loss (not concealed) or damage to carload and less than carload freight to the limit of $25. Agents at New Orleans, Houston, Beaumont, Victoria and Brownsville, $50.

"Agents must not pay claims for damage to perishable freight, alleged loss of grain or coal from carload or less than carload shipments, damage to live stock, nor for damage to sewer pipe, drain tile and kindred articles. All such claims should be promptly forwarded to the head office.

"No claim for shortage must be adjusted under this authority until twenty (20) days after shortage is noted.

"Before paying claims, agent must satisfy himself of the invoice value and also satisfy himself that proper credit is given for the salvage or insist upon such salvage being turned over to the company." . . .

"Safety First" on the New York Central.

Marcus A. Dow, general safety agent of the New York Central Lines, is planning to hold meetings at prominent points on the company's lines at least as often as two each week. There was one at Toledo, O., on Wednesday of this week, and the next two are to follow at Watertown, N. Y., and Utica, N. Y. During the past five weeks meetings have been held at Erie, Rochester, Albany, Oswego, Syracuse, Corning, Buffalo, Detroit and Cleveland. Attendance has been voluntary, but the numbers present have ranged from 300 to about 1,000, and the officers of the road have been much pleased at the intelligent interest in the subject which has been taken by the employees in general. Some of the superintendents report interesting cases of the good results of the meetings. On the morning following one of the recent lectures, an engineman, who had been present at the meeting, was found spending an hour in teaching a new employee how to get on and off an engine or car safely. In another case a conductor, the day following a meeting, called the superintendent's attention to a man who had persisted in standing between the rails of the track and getting on the foot board of the engine as it moved toward him. The conductor had tried to correct this man's practice by giving him a friendly warning; but the dangerous practice was persisted in, so the conductor very properly reported the case to the superior officer.

"Safety First" with Variations.

"Safety First" on the Pennsylvania Railroad now includes moving picture exhibitions; and in connection with the last safety-first meeting in New York City, there was a lecture on "First Aid to the Injured" by the medical examiner of the Manhattan division of the road; and these two matters of utility were supplemented by some moving pictures illustrating humorous subjects, together with music by an orchestra led by the supervisor of signals.

This meeting, which was held on the evening of Thursday, May 8, in the auditorium of the Young Men's Christian Association in the Pennsylvania station, was attended by over 600 employees of the Manhattan division.

One of the moving picture films depicted a man being taught the proper way to handle tools; another scene showed a shopman learning how to operate safety appliances; and another was that of a mechanic working underneath a freight car and courting injury. Seeing the repairmen the foreman quickly informs him of his jeopardy and then demonstrates how to work under a car without fear of accident. Still another view illustrates how a car is thrown off the track through failure of the engineman to observe signals.

Following the moving pictures 63 lantern slides were shown, illustrating the usual subjects dealt with in lectures of this kind; and all of the slides were of a character to come "close home," being taken from scenes on the Manhattan division. Following the pictures five-minute talks were given by enginemen, conductors, foremen and others, including a signal maintainer. The medical examiner, in his lecture on "First Aid," cautioned workmen against hurrying just before closing time. Many accidents occur just before the luncheon or dinner hour.

Safety First on the Chicago Great Western.

The Chicago Great Western is pursuing a vigorous "Safety First" campaign with a view to arousing such active interest as will secure the co-operation of every man in the service. The entire system is now organized and good work is being done by all divisions and departments. An innovation that appears to be original with the Great Western is the setting aside of a day to celebrate the inauguration of the safety movement. The management has designated Saturday, May 24, as "Safety Day," and arrangements have been made to celebrate the day in a fitting manner at Oelwein, Ia. Special trains will be run over each division, arriving at Oelwein about 3:00 p. m. Athletic sports will be provided in the afternoon, and a "Safety Rally" will be held in the evening. The meeting will be attended by many general officers. It is expected that about 2,500 persons will attend.

The Great Western has also started a campaign of education among the public school children in all schools adjacent to its line, and has arranged to present banners and buttons to all classes and pupils in an attempt to inculcate in their minds the lesson it is desired to teach. The banners are arranged to hang upon the wall of the school room, and have a red cross on a white center and blue field with the words "Safety First" above the cross and "Safety Always" below the cross in white letters. The buttons have a red cross on a white background and a blue band with the words "Safety First, Safety Always" in white. These banners and buttons will be presented to the respective classes by speakers who will explain their significance. It is hoped that such an impression will be made on the minds of the school children as to cause them to recognize the danger of trespassing on railroad property as well as of unnecessary exposure to other risks.

The New Haven Investigation.

The attorney general at Washington announces that he is going to appoint a special attorney to investigate the New York, New Haven & Hartford Railroad; but first there will be careful study of the facts which have been brought out by the Interstate Commerce Commission, and by the proceedings before the grand jury, last year, when the New Haven and the Grand Trunk were accused of conspiracy.

At the hearing before the Interstate Commerce Commission at Washington last week the attorneys for the New York, New Haven & Hartford presented the following points:

The freight service between Boston and New York is the best in the world—eight to ten hours for 230 miles. The Boston & Maine, as a railroad machine, is overloaded. The reinstatement of 3,500 men in the fall of 1912 has improved service, but the road will not earn fixed charges this year. There was never

a more honest effort to treat fairly a subsidiary than has been made by President Mellen, in reference to the Boston & Maine. Except for the New Haven, the crisis on the Boston & Maine would have come earlier than it did. Improvement in rail service has decreased steamship revenues; there has been no suppression of boat traffic. In the complaint against the investment in and management of interurban railways, Brandeis is a minority of one. Connecticut and Rhode Island approve them. Public demand in Massachusetts now is that the New Haven build electric roads in connection with the Berkshire Street Railway. The New York, Westchester & Boston is built for the future.

The *Wall Street Journal,* summarizing the Boston hearings, says:

"Mr. Mellen stood upon his feet for five hours last week before Commissioner Prouty, and he fired such a broadside against the Brandeis charges that New England newspapers have not had time to digest it. It will take weeks for people to get a clear conception concerning the fallacies which Mr. Brandeis has so skillfully injected into the New England railroad situation. While the Validation Commission of the State of Massachusetts more than a year ago marked the Rhode Island trolleys down from their cost of $20,000,000 to about $6,000,000 and said their value was yet to be determined, and while Brandeis and his fellow agitators have been harping on this waste and extravagance for the upbuilding of transportation in New England, Mr. Mellen showed that the Rhode Island trolleys were earning 3 per cent. on a $24,000,000 cost; the New Haven following the same line of development it did with the Central New England, putting in more money to raise the efficiency and bring about profitable results in the end.

"Mr. Mellen believes that not only will the Rhode Island trolleys in a short time be returning 4 per cent. on their cost, but he has the figures to show that his New Haven investments, outside of the Boston & Maine, are now earning their cost to the New Haven on a 4 per cent. basis; in other words, the New Haven has the control of the Central New England, many trolley lines feeding the steam lines, and steamships co-operating therewith, all at probably no cost to the New Haven road so far as the money has been borrowed at 4 per cent. No other interest than the New Haven could have been found to raise money at 4 per cent. and put it into the development of transportation in New England."

Association of Railway Telegraph Superintendents.

The annual convention of the Association of Railway Telegraph Superintendents will be held at the Planters Hotel, St. Louis, Mo., May 20-23. On May 20, papers will be presented on Some Facts Concerning Telephone Transmission, by Elam Miller and Charles A. Robinson, both of the American Telephone & Telegraph Company, New York; Use of Telephone by Railroads for Despatching Trains, Handling Messages, etc., by J. C. Johnson, superintendent of telegraph, Pennsylvania Railroad; Inductive Disturbances as Affecting Telegraph and Telephone Circuits, by F. J. Howe, Western Union Telegraph Company.

On May 21, the papers will comprise Protection Against Lighting and High Currents for Telegraph and Telephone Equipment, by M. H. Clapp, superintendent of telegraph, Northern Pacific; Main Line Power for Selective Circuits, Including Transmission and Signaling, by Richard F. Spamer, Western Electric Company; Full Use of Wires, by H. D. Teed, superintendent of telegraph, St. Louis & San Francisco; Organization for Maintenance of Lines, by M. C. Allen, Western Union Telegraph Company.

On May 22, there will be a paper on Organization for Wire Chiefs and Telephone Inspectors, by J. B. Sheldon, superintendent of telegraph, Union Pacific.

Association of Railroad Chief Surgeons.

Plans for obtaining better sanitary conditions on railways were discussed at the annual meeting of the Association of Railroad Chief Surgeons held at the Hotel Sherman, Chicago, on May 5. A committee was appointed to co-operate with the committee of the American Medical Association assigned to the promotion of public health and railway sanitation. It was also decided to seek the co-operation of state boards of health and health officers in the various localities, with a view to obtaining supplies of pure water and ice for use on railway trains. Officers were elected as follows: President, Dr. W. H. Bohart, chief surgeon, Chicago & Eastern Illinois; vice-president, Dr. G. G. Dowdall, chief surgeon, Illinois Central; secretary, Dr. L. J. Mitchell, editor of the *Railway Surgical Journal.*

Utah Society of Engineers.

The Utah Society of Engineers at a recent annual meeting elected the following officers for the ensuing year: President, A. S. Peters, Mountain States Telephone & Telegraph Company, Salt Lake City, Utah; first vice-president, E. H. Beckstrand, University of Utah, Salt Lake City, Utah; second vice-president, H. D. Randall, General Electric Company, Salt Lake City, Utah; secretary, F. D. Ulmer, Oregon Short Line Railroad, Salt Lake City, Utah; treasurer, L. H. Krebs, No. 968 West Third South street, Salt Lake City, Utah.

Railway Development Association.

At the annual meeting of the Railway Development Association, held in Nashville, Tenn., on May 7, the following officers were elected: President, W. W. Wood, general industrial agent of the Baltimore & Ohio; vice-president, Rutledge Smith, of Nashville, Tenn.; secretary, W. H. Labaume, Roanoke, Va.; treasurer, L. L. Lawrence, of Laurel, Miss.

Cleveland Engineering Society.

At the regular meeting of the Cleveland Engineering Society on May 13, J. H. Stratton, of the Wellman Seaver Morgan Company, Cleveland, Ohio, presented an illustrated paper on the Development of Ore Unloading on the Great Lakes. An informal meeting of the society will be held on May 20, at which W. A. Faber, of the American Steel & Wire Company, Cleveland, will present a paper on Boiler Furnace Efficiency.

New York Railroad Club.

At the next regular meeting of the New York Railroad Club, to be held May 16, Frederick C. Syze will present a paper on Thoughts on Discipline.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York. Annual meeting, October 14-15, Philadelphia, Pa.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

Bridge and Building Supply Men's Association.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.
Car Foremen's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
Civil Engineers' Society of St. Paul.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
Freight Claim Association.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.
General Superintendents' Association of Chicago.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
International Railway Congress.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.
International Railway Fuel Association.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.
International Railway General Foremen's Association.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.
International Railroad Master Blacksmiths' Association.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.
Maintenance of Way & Master Painters' Association of the United States and Canada.—W. G. Wilson, Lehigh Valley, Easton, Pa.
Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.
Master Car Builders' Association.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.
Master Car and Locomotive Painters' Assoc. of U. S. and Canada.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.
National Railway Appliance Assoc.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.
New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
Northern Railroad Club.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
Railway Business Association.—Frank W. Noxom, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.
Railway Club of Pittsburgh.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
Railway Electrical Supply Manufacturers' Assoc.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.
Railway Gardening Association.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.
Railway Development Association.—W. Nicholson, Kansas City Southern, Kansas City, Mo.
Railway Signal Association.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.
Railway Storekeepers' Association.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.
Railway Supply Manufacturers' Assoc.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.
Railway Tel. and Tel. Appliance Assoc.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.
Richmond Railroad Club.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.
Roadmasters' and Maintenance of Way Association.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
Signal Appliance Association.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.
Society of Railway Financial Officers.—C. Nyquist, La Salle St. Station, Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.
Southern & Southwestern Railway Club.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
Toledo Transportation Club.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
Track Supply Association.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.
Traffic Club of Chicago.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
Traffic Club of Pittsburgh.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
Traffic Club of St. Louis.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.
Train Despatchers' Association of America.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.
Transportation Club of Buffalo.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
Transportation Club of Detroit.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.
Utah Society of Engineers.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
Western Railway Club.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
Western Society of Engineers.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Texas railways have filed tariffs with the Interstate Commerce Commission, effective June 2, providing that they will cease paying loading charges on carload freight handled across the Galveston wharves.

Effective May 11, trains 7 and 8 on the Chicago & Alton, known as the "Midnight Special," leaving Chicago and St. Louis at 12:01 a. m., were made through non-stop trains between those points. They will not carry any mail or express and will be exclusively for Chicago-St. Louis passengers.

J. M. Belleville, president of the National Industrial Traffic League, has issued a call for a meeting of the league, to be held at the Iroquois hotel, Buffalo, on May 23 and 24, for the purpose of receiving reports of various committees and of discussing an extensive docket on various topics relating to the relation between railways and shippers.

A complaint has been filed with the Interstate Commerce Commission by Anderson, Clayton & Coat, Oklahoma City, asking a reduction in the rates on gin-compressed round bales of cotton below the rates charged for cotton when shipped in square bales. It is stated in the complaint that while four 36-ft. cars would be required to carry 50,000 lbs. of flat cotton, and two cars to carry the same weight of cotton in flat bales, a single 36 ft. car loaded with round bale cotton will carry 50,000 lbs., and yet the same freight rate is charged on 100 lbs. in a round bale as in the flat, or compressed only in square bales. A reduction of 33 1/3 per cent. is asked.

Prof. F. R. Stevens, the agricultural specialist employed by the Lehigh Valley to travel around among the farmers in the territory adjacent to that road, has added to the wealth of the farmers an amount equal to "scores of times the money paid to him." This is stated on the authority of L. W. Lighty, a farmer whose letter has been printed in an agricultural journal, and republished by the railroad company. Mr. Lighty says of Mr. Stevens: "He is conservative and always advises caution in new and untried moves. His rule is not to attempt to help a farmer until the farmer asks to be helped. At first not many asked, but now the requests come so fast and thick that he is able to reach only about a fourth of those who ask for assistance." Mr. Lighty's estimate of value is made on the authority of the farmers, who have observed the work done by the specialist during the past three years. And he adds: "Why do other large railroad systems follow this good example? Why does not our commonwealth join hands and assist in this excellent work?"

Proposed General Increase in Freight Rates.

The application of the Eastern Trunk lines for authority to make a general increase of 5 per cent. in freight rates was presented to the Interstate Commerce Commission at Washington on Wednesday of this week, the spokesmen for the railways being George F. Brownell, vice-president of the Erie; George S. Patterson, general counsel of the Pennsylvania; Clyde Brown, general solicitor of the New York Central, and Hugh Bond, general counsel of the Baltimore & Ohio, representing the fifty-two lines east of the Mississippi and north of the Ohio and Potomac.

The petition recited the efforts of the eastern lines three years ago to obtain permission to increase their freight rates. The commission at that time indicated a willingness to reconsider its conclusions in the light of future developments in the operation of the carriers. The petition declares that the carriers are prepared to show that the cost of conducting the business has been, and is being, steadily increased by increases in capital charges, increases in wages, increases in taxes, increased burdens imposed by legislative enactment, elimination of grade crossings and in various other respects, and that existing rates are insufficient to afford just and reasonable compensation and return to the carriers, and are unreasonably low in view of the value of the service afforded.

The commission promised to take up the subject at an early date, but gave no assurance that even if the case were reopened it would be able to conduct the necessary public hearings before the summer recess.

There has been much speculation as to the extent to which actual and formal expression will be made before the commission of the opposition to an advance in rates, which opposition has been voiced in the newspapers by numerous spokesmen for shippers. Some railroad officers say that they have tangible evidence that shippers are much less inclined to oppose an advance than they were in 1910.

Samuel Rea, president of the Pennsylvania Railroad, in a published statement gives reasons for an increase in freight rates as follows:

"The annual revenue from freight in the territory concerned is about $800,000,000. Five per cent. of this is $40,000,000. There are about 40,000,000 people in this portion of the country. The proposed increase, therefore, means an average of $1 per year per head of population—8 cents a month.

"Everybody knows that the railroads have been put to greatly increased expense in recent years. On the Pennsylvania lines east of Pittsburgh the added cost of new legislation from August, 1906, to December, 1912, was nearly $11,000,000. Recently many more laws have been enacted. The New Jersey grade crossing bill alone involves a cost to this company of more than $60,000,000. Extra crew laws, drinking water laws, railroad valuation laws are all adding to the cost of operation.

"Now, if the public through constituted authority, demands certain measures of safety, certain improvements, such measures of safety and comfort must be paid for by somebody. As a matter of fact, there are nearly 100,000 persons interested as investors in the stock of the different companies of the Pennsylvania Railroad system. It is likely that holders of this company's bonds number 200,000. Strike at the investors in railroad securities and you hurt depositors of savings banks, policyholders in life insurance companies, women investors and many others least able to cope with the situation.

"As Mr. Prouty said, 'The United States is trying an experiment which has never been successfully worked out yet in the history of the world. It is trying to build, develop and operate its railroads by private capital under rates and regulations fixed, not by the owners of that capital, but by the public. The question is, Can you obtain under this system the new capital necessary to develop our present railroad systems and to build our new railroad systems?'

"Are the people willing to pay the railroads sufficient freight rates to enable them to render the service which the people demand and should have? The country is growing; unless its growth is to be stultified, its railroads must grow. It is impossible to continue this building and developing of railroads of the country without more capital. To obtain that capital, the railroads must have credit—credit that will withstand the scrutiny of the banker of Lombard street, as well as appeal to the investor in Philadelphia. That credit cannot be assured and maintained unless the railroads are permitted to earn sufficient revenue to have left over at the end of the year a surplus out of which to make the necessary improvements which do not add to the earning power of the company and which yet assure the investor of the productive value, both new and prospective, of the enterprise in which he proposes to put his money."

At Pittsburgh May 5 Mr. Rea said that the Pennsylvania earned last year only 4.83 per cent. on its investment. Explaining this he says:

"Reference in this case was to the earnings of $35,776,669 in 1912 for *railroad* business alone—approximately 4.83 per cent.—upon the $741,120,877 which had been actually expended upon the transportation property of the Pennsylvania Railroad Company. The cost of bonds and stocks of other companies held by this company is not included in this $741,120,877, nor is the income derived therefrom embraced in the earnings of $35,776,669.

"This sum of $741,120,877 was in part provided out of capital stock and bonds and in part out of surplus earnings, and is made up by adding to the cost of road and equipment, as shown in the annual reports, the amounts also therein reported of appropriations from surplus for improvements. A liberal portion of the surplus earnings, instead of being paid out as dividends, has been expended on additions and betterments which have largely improved the facilities at the disposal of the public—facilities which have enabled the railroad to give better service. If the investors in the stock and bonds of the Pennsylvania Railroad had supplied directly all the money which has been invested in the transportation property of this company—after the fashion in vogue in England—and if they received the entire annual net earnings from the operations of such property, they would today be getting only 4.83 per cent. on their actual cash outlay."

Car Location.

The accompanying table, which is taken from Car Location bulletin No. 5-A of the American Railway Association, gives a summary of the location of freight car equipment by groups on April 15, together with surpluses and shortages on the same date.

CAR LOCATION ON APRIL 15, 1913.

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	89,240	673,303	281,867	203,400	170,599	472,806	16,929	149,005	33,179	112,055	131,273	2,333,656
Home Cars on Home Roads	42,224	367,953	93,233	108,295	79,252	296,028	4,605	74,109	15,374	65,274	81,905	1,228,252
Home Cars on Foreign Roads	47,016	305,350	188,634	95,105	91,347	176,778	12,324	74,896	17,805	46,781	49,368	1,105,404
Foreign Cars on Home Roads	55,656	295,407	210,005	94,529	84,470	180,133	10,855	65,129	21,976	42,514	57,088	1,117,762
Total Cars on Line	97,880	663,360	303,238	202,824	163,722	476,161	15,460	139,238	37,350	107,788	138,993	2,346,014
Excess or Deficiency	8,640	*9,943	21,371	*576	*6,877	3,355	*1,469	*9,767	4,171	*4,267	7,720	12,358
Surplus	1,391	13,481	2,230	7,519	740	9,340	5,534	6,397	4,136	18,192	1,755	70,715
Shortage	171	1,057	1,891	3,150	1,447	649	50	1,310	43	390	3,059	13,217
Shop Cars—												
Home Cars in Home Shops	4,281	30,351	16,107	9,706	11,836	20,511	636	8,562	1,972	4,055	3,771	111,788
Foreign Cars in Home Shops	1,266	8,378	6,554	2,304	2,298	4,945	607	2,088	761	1,904	825	31,930
Total Cars in Shops	5,547	38,729	22,661	12,010	14,134	25,456	1,243	10,650	2,733	5,959	4,596	143,718
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	47.32	54.65	33.08	53.24	46.46	62.61	27.20	49.74	46.34	58.25	62.39	52.63
Total Cars on Line	106.98	98.52	107.46	99.72	95.97	100.71	91.32	91.59	112.57	96.19	105.88	100.53
Home Cars in Home Shops	4.80	4.51	5.71	4.77	6.94	4.64	3.76	5.75	5.94	3.62	2.87	4.85
Foreign Cars in Home Shops	1.07	1.24	2.33	1.13	1.34	1.12	3.58	1.32	2.30	1.70	.63	1.39
Total	5.87	5.75	8.04	5.90	8.28	5.76	7.34	7.07	8.24	5.32	3.50	6.24

*Denotes deficiency.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association in presenting statistical bulletin No. 143, giving a summary of car surpluses and shortages by groups from January 31, 1912, to May 1, 1913, says:

The total surplus on May 1 was 53,977 cars; on April 15, 70,715 cars; and on May 9, 1912, 136,776 cars. Compared with the preceding period; there is a decrease in the total surplus of 16,738 cars, of which 4,394 is in box, 908 in flat, 9,602 in coal and 1,834 in miscellaneous cars. The decrease in box car surplus is in all groups, except 5 (Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida), 9 (Texas, Louisiana and New Mexico), and 11 (Canadian Lines). The decrease in flat car surplus is in all groups, except 1 (New England Lines), and 5 (as above). The decrease in coal car surplus is in all groups, except 4 (the Virginias and Carolinas), and 5 (as above). The decrease in miscellaneous car surplus is in groups 1 (as above), 2 (New York, New Jersey, Delaware, Maryland and eastern Pennsylvania), 4 (as above), 7 (Montana, Wyoming, Nebraska and the Dakotas), 8 (Kansas, Colorado, Oklahoma, Missouri and Arkansas), and 10 (Washington, Oregon, Idaho, California, Nevada and Arizona).

The total shortage on May 1 was 14,178 cars; on April 15,

13,217 cars; and on May 9, 1912, 6,678 cars. Compared with the preceding period; there is an increase in the total shortage of 961 cars, of which 81 is in flat, 1,537 in coal, and a decrease of 27 in box and 630 in miscellaneous cars. The decrease in box car shortage is in groups 2 (as above), 3 (Ohio, Indiana, Michigan and western Pennsylvania), 4, 7, 8 and 11 (as above). The increase in flat car shortage is in groups 1, 5 (as above), 6 (Iowa, Illinois, Wisconsin and Minnesota), and 8 (as above). The increase in coal car shortage is in all groups, except 6, 7, 8, 9, 10 and 11 (as above). The decrease in miscellaneous car shortage is in groups 3, 4, 5, 8 and 11 (as above).

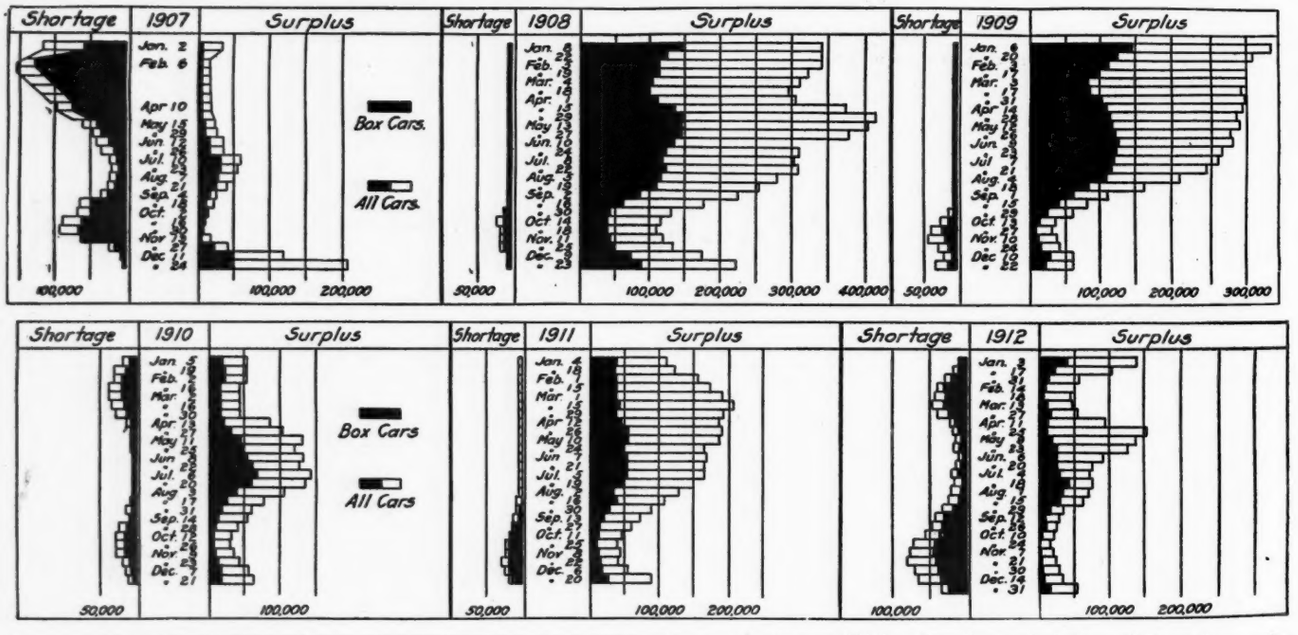
Compared with the same date of 1912, there is a decrease in the total surplus of 82,799 cars, of which 2,276 is in box, 202 in flat, 71,269 in coal and 9,052 in miscellaneous. There is an increase in the total shortage of 7,500 cars, of which 3,860 is in box, 592 in flat, 2,500 in coal and 548 in miscellaneous cars.

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and the diagram shows total bi-weekly surpluses and shortages from 1907 to 1913.

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—May 1, 1913	7	491	668	75	22	1,256	259	224	150	1	634
" 2.— " 1, 1913	35	421	36	4,036	115	4,608	70	0	451	0	521
" 3.— " 1, 1913	33	464	339	230	1,479	2,512	968	131	1,340	234	2,673
" 4.— " 1, 1913	11	3,783	7	779	955	5,524	1,171	432	1,369	26	2,998
" 5.— " 1, 1913	28	129	27	222	584	962	1,281	549	295	20	2,145
" 6.— " 1, 1913	32	2,762	180	1,519	3,742	8,203	1,162	244	35	16	1,457
" 7.— " 1, 1913	5	228	44	592	600	1,464	0	0	0	0	0
" 8.— " 1, 1913	20	1,287	238	1,788	2,415	5,728	268	27	89	371	755
" 9.— " 1, 1913	17	2,141	136	297	1,537	4,111	250	0	0	10	260
" 10.— " 1, 1913	25	5,656	1,286	2,591	7,887	17,420	81	21	4	405	511
" 11.— " 1, 1913	7	988	98	114	989	2,189	1,644	418	0	162	2,224
Total	220	18,350	3,059	12,243	20,325	53,977	7,154	2,046	3,733	1,245	14,178

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin and Minnesota lines; Group 7—Montana, Wyoming, Nebraska, North Dakota and South Dakota lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Washington, Oregon, Idaho, California, Nevada and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages, 1907 to 1913.

INTERSTATE COMMERCE COMMISSION.

The ruling of the commission in conference on April 8 that the term "families," as contained in the pass provisions, does not include nurses who may be in attendance upon and traveling with a railway employee who is entitled to free transportation, has been rescinded by the commission.

The commission has ruled that carriers shall be permitted to charge for copies of their tariffs, such charges not to exceed the cost of the paper, of the extra printing and of mailing. It is discriminatory to furnish certain shippers with copies of the tariffs and to deny such copies to other shippers. The carriers will be required to publish price lists of their tariffs and to print enough copies to meet the demand.

The commission has suspended from May 8 until September 5 the supplement to the tariff of the Southern Railway, which would cancel through joint rates on smoking and plug tobacco in less than carload lots from Winston-Salem, N. C., to points in Maryland, Delaware and Virginia reached by water from Baltimore, Md., providing that on and after May 8 combination rates apply. While this would result in no increase in rates, it is claimed by shippers that the publication of through rates greatly facilitates correct prepayment of freight charges.

The commission has suspended from May 12 until September 9 the supplement to the tariff of the Chicago & Alton, which cancels existing through joint rates applicable to the transporta-

tion of bituminous coal, in carloads, from the following mines located on the line of the Toledo, St. Louis & Western in Illinois: Coffeen, Edwardsville, Panama and Sorento, on traffic destined to points located on the Chicago, Milwaukee & St. Paul in Wisconsin, Minnesota and other states. Such cancellation would result in substantial increases by the application of combination rates.

The commission has suspended from May 11 until September 8 the items in a supplement to Agent F. A. Leland's tariff, which contain exceptions to the Western classification and affect the rating on iron and steel window sash (glazed), C. L., and iron and steel window frames when shipped with sash from interstate points to points in Texas, Louisiana and Mexico. Under the present provisions, glazed sash are rated fifth class and may be shipped at that rating in carloads mixed with window frames. The proposed provisions rate sash at fourth class and frames at fifth class ratings, C. L., and will not permit of mixing at the lower rating.

The commission has suspended from May 5 until September 2 tariff of the Chicago & North Western, and from May 10 until September 2 certain schedules contained in supplements to the tariff of the Chicago Great Western. The first mentioned tariff contains a schedule increasing from 13 cents to 16 cents per 100 lbs. the rate applicable to the transportation of cement in carloads from Mason City, Ia., to International Falls, Minn. Schedules suspended in the above-mentioned issues of the Chicago Great Western cancel existing joint rates between same points as well as the rates to intermediate points on the lines of the Northern Pacific, Minnesota & International and Big Fork & International, including Bemidji and Pequot, Minn., providing in lieu thereof for the application of combination rates, which results in advances; for example, the present rate to Bemidji is 13 cents and the proposed rate is 20 cents per 100 lbs.

Complaint Dismissed.

Scott Paper Company v. Pennsylvania Railroad. Opinion by the commission:

The commission decided that the rates on toilet paper from Philadelphia, Pa., to points in central freight association territory were not unreasonable or unjustly discriminatory as compared with rates from Albany, N. Y. (26 I. C. C., 601.)

Kellogg Food Company v. Grand Trunk Railway Company of Canada et al. Opinion by Commissioner Meyer:

The commission decided that the classification of food products known as Protose, Nutose, and Nuttolene under third class in official classification was not unjustly discriminatory. (26 I. C. C., 611.)

Rates on Excelsior and Flax Tow.

In re investigation and suspension of advances in rates by carriers for the transportation of excelsior from St. Paul, Minn., and other points to Chicago, Ill., and other points.

In re investigation and suspension of advances in rates by carriers for the transportation of flax tow, flax moss, and flax fiber, between St. Paul, Minn., Winona, Minn., and other points and Chicago, Ill., Peoria, Ill., Kansas City Mo., and other points. Opinion by the commission:

The commission decided that the proposed advances in the rates on flax tow and excelsior from St. Paul to Chicago were justified. The proposed advances in the rates on flax tow and excelsior from St. Paul to Des Moines, Omaha, Kansas City and other points were found not to have been justified. The carriers, however, are not precluded from undertaking reasonable adjustments of the rates to the latter points. (26 I. C. C., 689.)

Cement Rate Increased.

In re investigation and suspension of cement rates from Pennsylvania to New Jersey points. Opinion by Commissioner Marble:

The commission will not, for the purpose of indirectly influencing intrastate rates, prevent increase of an interstate rate on which no tonnage moves to a basis in harmony with like rates in the same region. The commission decided that the proposed advance in the joint rate on cement, Nazareth, Pa., group to Phillipsburg, N. J., was justified. The order of suspension will be vacated. (26 I. C. C., 687.)

Panhandle Not the Pennsylvania Company.

Duhlmeier Brothers v. Pennsylvania Company et al. Opinion by the commission:

A car of lumber reached Chicago via the line of the Pennsylvania Company. The complainant sent instructions for delivery of the car to agents of the Pittsburgh, Cincinnati, Chicago & St. Louis, which did not handle the shipment. Owing to delay in receipt of delivery instructions by the Pennsylvania Company demurrage charges accrued, which the complainant seeks to recover. Although the Pittsburgh, Cincinnati, Chicago & St. Louis is one of a group of roads comprising the Pennsylvania system, that line and the lines of the Pennsylvania Company are separately operated, file separate reports and tariffs, and are shown in railroad publications as distinct railway companies. The commission decided that notice to the Pittsburgh, Cincinnati, Chicago & St. Louis was not notice to the Pennsylvania Company and that demurrage charges were properly collected. The complaint was dismissed. (27 I. C. C., 4.)

Damages of $2.50 Denied.

Joseph F. Maxey v. Baltimore & Ohio Southwestern. Opinion by the commission:

A shipment of household goods was billed from Atlanta, Ga., to Newport, Ky. The defendant has no warehouse facilities of its own at Newport, but uses the Louisville & Nashville depot for making deliveries. Newport is regarded as a part of the Cincinnati terminals, so far as freight charges and deliveries are concerned. On the arrival of the shipment at Cincinnati, Ohio, the consignee was notified that the shipment would be forwarded to Newport or could be called for at Cincinnati. The consignee called for the goods at Cincinnati, and the cost of the drayage amounted to $2.50. The complainant contends that as the shipment was billed to Newport, the cost of the drayage should be refunded by the defendant. The commission decided that as the consignee was given the option of receiving the freight at either Newport or Cincinnati, and as it had not been shown that to have secured proper delivery by rail would have involved an unreasonable delay, the complaint should be dismissed. (26 I. C. C., 506.)

Protection of Potato Shipments in Winter.

In re investigation and suspension of new rules governing the allowance for stoves and lining of cars transporting potatoes from points in Minnesota and Wisconsin to points west of the Mississippi river. Opinion by Commissioner Harlan:

Hitherto when shipments of potatoes have been made in winter, shippers have lined the cars and provided stoves and attendants to protect the shipments from the cold. The carriers have exacted no charge for the transportation of the attendants, the stoves or the lining, either to the destination or for the return trip. Although this has been the practice in the region in question, the tariffs of the carriers did not provide specifically for this practice. The tariffs under suspension provide rules governing such shipments, and include changes from the previous practice. One of the new rules is that the carriers refuse to accept shipments of potatoes during the period from November 1 to April 15, unless the shipper at his own expense provides for protection against the cold. The carrier also reserves the right of accepting such shipments when in its judgment the weather conditions permit. The complainant contends that the carrier should provide protection against freezing in transit. The commission decided that as the potato traffic from the points of origin in question was large, and as carriers in other parts of the country furnished protection against freezing, and as section 1 of the Act requires carriers to provide all services of ventilation, refrigeration or icing, storage and handling of property transported, the carriers should be required by law to provide the service asked for by the shippers. The commission also decided that as, under the present rules, the shippers were responsible for damage by freezing, the carriers could not reserve the right of refusing shipments on account of weather conditions. No order was entered, but the commission urged that a conference be held between the shippers and carriers, so that mutually satisfactory regulations could be determined upon. The case will be held open for a future order in case the result of the conference is not satisfactory. (26 I. C. C., 681.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$303,461	$87,859	$431,043	$55,516	$100,320	$13,930	$152,531	$8,842	$331,139	$99,904	—$652	$14,476	$84,776	—$13,807
Ann Arbor	292	122,905	36,813	170,809	25,156	24,448	3,784	63,973	6,936	124,297	46,512	8	13,930	32,590	—16,623
Arizona Eastern	366	187,543	40,215	238,201	38,388	23,833	3,196	62,071	8,808	136,296	101,905	385	11,800	90,490	13,661
Belt Ry. Co. of Chicago	21	.....	.....	269,567	14,824	38,941	472	115,797	5,012	175,046	94,521	.....	7,927	86,594	9,633
Butte, Anaconda & Pacific	46	92,711	8,755	111,104	8,073	18,876	614	56,928	2,597	87,088	24,016	.....	2,000	22,016	7,966
Central Vermont	411	226,941	68,427	323,390	32,138	53,543	7,675	174,931	6,616	274,903	48,487	—134	16,927	31,426	—39,977
Chicago & Eastern Illinois	1,275	959,387	212,731	1,268,382	115,677	309,928	28,540	530,941	37,527	1,022,613	245,769	—308	45,000	200,461	—143,598
Chicago & Erie	270	342,629	47,741	433,232	79,465	106,220	21,071	266,776	11,815	485,347	—52,115	1,856	13,333	—63,592	—54,640
Chicago Junction	12	.....	.....	160,411	13,198	5,679	1,168	90,017	4,246	114,308	46,103	.....	2,470	43,633	—13,877
Cincinnati, New Orleans & Texas Pacific	337	653,449	138,934	839,206	78,222	200,595	23,843	274,809	18,992	596,461	242,745	—1,224	29,000	212,521	—7,107
Cleveland, Cincinnati, Chic. & St. Louis.	2,014[1]	1,798,362	536,672	2,551,495	285,245	560,648	74,419	1,129,849	53,184	2,103,345	448,150	—2,118	103,800	342,232	—296,987
Delaware & Hudson Co. R. R. Dept.	854[2]	1,640,883	196,451	1,908,762	143,190	294,884	22,007	730,839	61,347	1,252,267	656,495	—6,251	49,700	600,544	56,677
Detroit & Toledo Shore Line	79	115,783	.....	116,166	8,520	6,502	1,369	37,838	2,482	56,711	59,455	.....	7,237	52,218	—2,659
Detroit, Toledo & Ironton	441	92,767	9,501	111,901	35,946	23,539	2,460	65,625	4,918	132,488	—20,587	.....	5,000	—25,587	—48,221
Georgia	307	201,697	69,722	291,118	28,381	45,190	11,273	131,058	8,347	224,249	66,869	.....	2,950	63,919	3,541
Georgia, Southern & Florida	395	148,332	69,156	247,508	27,259	40,229	8,261	98,284	9,010	183,043	64,465	—126	10,107	54,232	16,096
Hocking Valley	352[3]	377,446	69,555	478,469	55,992	128,569	8,806	163,342	14,220	370,929	107,540	.....	37,500	70,040	—145,531
Houston, East & West Texas	191	93,955	29,652	131,015	21,882	10,421	2,012	48,449	3,893	86,657	44,358	.....	3,833	40,525	12,154
Houston & Texas Central	789	364,383	149,777	558,397	96,055	100,635	19,746	246,945	16,291	479,672	78,725	—248	19,957	58,520	62,190
Indiana Harbor Belt	105	.....	.....	277,978	46,223	29,059	969	141,093	7,757	225,101	52,877	129	5,500	47,506	—33,748
International & Great Northern	1,160	573,318	163,947	800,443	116,569	118,557	25,401	401,301	30,597	692,425	108,018	—1,274	30,000	76,744	7,247
Lake Erie & Western	906[4]	360,504	60,348	444,881	72,203	95,289	10,937	180,755	12,429	371,613	73,268	.....	20,000	53,268	—42,016
Lehigh & Hudson	97	129,892	3,591	140,229	12,472	23,532	1,362	55,385	3,809	96,560	43,669	.....	4,000	39,669	—23,903
Louisiana & Arkansas	255	140,229	18,559	164,108	23,859	23,473	2,389	37,310	5,048	92,079	72,029	.....	4,500	67,529	13,343
Louisiana Ry. & Navigation	351	118,137	20,166	148,617	23,998	21,627	6,090	63,225	8,573	123,513	25,104	.....	4,500	20,604	—6,625
Louisiana Western	208	142,923	60,757	212,314	24,795	49,691	8,941	64,991	5,620	154,038	58,276	705	7,260	51,721	5,464
Louisville, Henderson & St. Louis	200	66,522	28,330	101,163	21,276	13,919	4,179	45,480	3,016	87,870	13,293	221	3,000	10,514	—11,959
Maine Central	1,206[5]	683,627	248,428	981,249	82,361	167,301	7,615	416,518	28,693	702,488	278,761	—4,762	46,736	227,263	—5,580
Michigan Central	1,817	2,019,883	647,853	2,972,193	344,000	466,209	66,438	1,311,170	55,858	2,243,675	728,518	—6,418	116,000	606,100	—124,175
Missouri, Kansas & Texas System	3,817[6]	1,573,591	722,334	2,469,433	399,772	310,512	61,050	1,046,610	88,281	1,906,225	563,208	—8,696	103,844	450,668	250,018
Mobile & Ohio	114	897,989	112,985	1,081,109	132,596	191,834	41,059	386,408	36,655	788,552	292,557	—1,781	30,141	260,635	42,128
Morgan's La. & Tex. R. R. & S. S. Co.	404	262,607	99,570	388,821	69,889	55,238	16,822	189,088	11,912	342,949	45,872	—1,821	18,250	25,801	—32,917
New Orleans, Mobile & Chicago	547	178,965	27,583	217,338	28,750	24,762	3,903	96,723	8,051	162,189	55,149	—128	7,407	47,615	22,574
New Orleans, Texas & Mexico	281[7]	100,971	16,370	125,289	19,109	12,532	3,664	65,136	6,147	106,588	18,701	.....	1,441	17,260	—3,494
New York, Susquehanna & Western	154[8]	174,697	43,800	252,939	17,740	31,207	1,913	103,404	5,442	159,706	93,233	—3,418	14,673	75,142	3,701
Northwestern Pacific	401	98,763	138,882	259,527	39,503	55,602	3,182	107,157	12,759	218,203	41,324	.....	13,050	28,274	18,232
Pecos & Northern Texas	479	138,709	37,028	187,764	23,114	49,202	4,458	67,285	6,505	150,564	37,200	.....	6,325	30,875	—2,572
Peoria & Eastern	352	207,388	49,247	272,748	31,611	59,839	4,847	116,464	5,480	218,241	54,507	.....	10,400	44,107	—30,626
Pere Marquette	2,330	1,011,358	272,227	1,395,394	190,531	199,715	31,123	611,687	31,855	1,064,911	330,483	25,264	32,857	322,890	289,611
Pittsburgh & Lake Erie	223[9]	1,403,702	133,441	1,595,555	163,888	262,647	12,361	385,543	32,969	857,408	738,147	—163	55,200	682,784	56,505
Richmond, Fredericksburg & Potomac	88[10]	134,707	115,357	281,114	26,302	29,213	2,785	96,386	6,374	161,060	120,054	—230	721	119,103	56,498
St. Joseph & Grand Island	319	70,472	26,906	108,306	26,226	21,042	4,757	63,489	5,686	121,200	—12,894	674	6,244	—18,464	9,801
St. Louis, Brownsville & Mexico	518[11]	157,498	79,117	259,718	35,893	24,619	4,577	122,584	10,149	197,822	61,896	.....	5,500	56,396	15,065
St. Louis, San Francisco & Texas	244	83,416	24,598	115,154	17,781	14,912	2,799	68,769	5,610	109,871	5,283	.....	1,225	4,058	—7,674
St. Louis Southwestern	906[12]	582,101	110,835	730,351	70,257	98,833	30,089	174,278	27,943	401,400	328,951	—618	26,796	301,537	79,846
San Pedro, Los Angeles & Salt Lake	1,135[13]	476,683	254,551	787,561	78,577	148,931	32,793	273,298	18,468	552,067	235,494	—2,084	42,557	190,853	88,089
Southern in Mississippi	281	46,901	25,720	79,638	30,710	9,591	2,542	43,874	4,155	90,872	—11,234	.....	8,080	—19,314	—8,033
Southern Kansas of Texas	125	91,922	15,908	112,350	8,321	27,945	2,641	39,075	3,831	81,813	30,537	.....	2,328	28,209	345
Tennessee Central	294	102,371	32,668	142,756	23,201	14,713	5,390	49,079	7,307	99,690	43,066	.....	4,265	38,801	20,050
Texas & New Orleans	458	255,775	103,808	384,909	115,037	60,363	9,351	152,944	12,009	349,705	35,204	808	13,604	22,408	—7,720
Toledo & Ohio Central	443	304,325	41,002	357,778	78,869	83,226	6,823	146,875	9,330	325,123	32,655	—915	21,604	10,136	—90,856
Toledo, Peoria & Western	248	59,439	36,040	101,796	16,870	27,916	2,597	40,338	3,649	91,370	10,426	.....	5,900	4,526	—6,831
Ulster & Delaware	129	49,404	16,656	69,843	8,735	14,028	854	36,979	2,876	63,472	6,371	26	3,300	3,077	—8,038
Virginia & Southwestern	240	128,768	13,410	145,699	20,333	34,572	2,183	40,216	3,431	100,735	44,964	.....	7,232	37,732	—11,506
Wabash	2,515	1,718,533	499,904	2,439,766	301,584	427,531	81,748	1,150,910	61,728	2,023,501	416,265	—1,774	84,283	330,208	89,984
Washington Southern	36	39,623	57,640	127,747	13,858	13,237	1,075	50,579	2,801	81,550	46,197	—165	3,290	42,742	8,977
Western Maryland	543	546,331	64,282	629,128	73,902	83,095	15,352	298,556	12,050	482,955	146,173	.....	20,000	126,173	79,435
Western Pacific	937	350,054	108,932	474,360	68,884	47,109	28,073	198,584	24,799	367,449	106,911	—1,400	26,461	79,050	109,811
Western Ry. of Alabama	133	77,011	39,441	128,616	19,689	22,119	6,858	34,688	5,911	89,265	39,351	—2	4,929	34,420	7,352

Average mileage operated during previous period—[1] 2,012; [2] 852; [3] 353; [4] 886; [5] 1,204; [6] 3,399; [7] 277; [8] 152; [9] 215; [10] 83; [11] 510; [12] 843; [13] 1,116. — Indicates Deficits, Losses and Decreases.

Texas City Wharfage Charges Reduced.

In re wharfage charges of the Galveston Wharf Company, at Galveston, Tex. Opinion by Commissioner Harlan:

In the original case, 23 I. C. C., 533, the commission found that the railway companies were discriminating against Galveston and the Galveston Wharf Company in favor of Texas City and the Texas City Terminal Company by paying to the latter company excessive divisions out of the rates to that port. As the record was not broad enough to justify a definite order fixing the division for the future, the carriers were directed to confer with representatives of the two wharf companies and to submit a new schedule of divisions with the Terminal company. Conferences were held, but the parties failed to agree. The commission was, therefore, asked to fix the division. The commission decided that the Texas City Terminal Company, in compensation for its services and the use of its facilities, is entitled to a switching allowance of $3.50 per loaded car. Any allowance to that company in excess of that amount will be an unjust discrimination against the Galveston Wharf Company. Settlement between the Texas City Terminal Company and its trunk line connections may be made on the basis here stated for services rendered since August 1, 1912. The Galveston Commercial Association pointed out that the Texas City interests were offering to the American Steel & Wire Company and other large shippers warehousing services on their wharves at Texas City at less than cost, and that they are able to do this only because of the large divisions out of the rates that the Terminal company was formerly receiving and will be able to continue to do it only in the event that the commission fixes the allowance of the Texas City Terminal Company on an excessive basis. The commission was not prepared to express any view as to the legality of these arrangements, but will look into them further and take such steps as may be required. No order was deemed necessary. (26 I. C. C., 695.)

STATE COMMISSIONS.

The Board of Railway Commissioners for Canada has passed an order, requiring the Grand Trunk to renew the rails on its Barrie division, between miles 22 and 26; and directing that, until the completion of the work, trains between Trout Creek and Powassan shall not run faster than 15 miles an hour.

The Pennsylvania State Railroad Commission has dismissed the case of the teamsters of Philadelphia who asked for an order requiring the Pennsylvania and the Reading railroads, at their freight houses in Philadelphia, to truck goods to the door, so that teamsters could load packages on to their wagons with the least possible labor. The commission holds that to order the roads to change their practice in the way desired would not hasten delivery of freight.

COURT NEWS.

The Supreme Court of Texas has rendered a decision sustaining an injunction issued by the district court of Anderson county, restraining the International & Great Northern from moving its machine shops and roundhouse from Palestine, Tex., to Houston.

The Supreme Court of the United States has declared unconstitutional the reciprocal demurrage law of Oregon, which was passed in 1907. The decision of the court is based on the same grounds as those laid down in the Minnesota case—that the law in its operation interfered with interstate commerce.

In the United States district court at Boston, May 8, the New York Central & Hudson River was convicted by a jury on eight charges of working trainmen unlawfully more than sixteen hours consecutively. On twenty other charges the road was acquitted, the delays having been found excusable under the terms of the law.

The Supreme Court of the United States has handed down a decision sustaining the employers' liability law of Indiana. The decision is in the suit of Hackett against the Chicago, Indianapolis & Louisville. Hackett was a yard switchman and sustained the loss of both legs through the fault of the yard foreman.

The Colorado & Southern, the Chicago, Burlington & Quincy, and the Union Pacific have filed an appeal in the United States district court at Denver from the decision of the Colorado Railroad Commission ordering reductions in freight rates on coal from the northern Colorado fields to Denver. The appeal follows the refusal of the commission to grant a re-hearing of the case.

The Supreme Court of the United States has affirmed the decision of the Supreme Court of Appeals of Virginia in a case against the Norfolk & Western for damages on a shipment of tobacco shipped from a point on that road to Texas on a through bill of lading, the damage having occurred while the property was in the hands of the Old Dominion Steamship Company. The decision simply sustains the Interstate Commerce law, as amended, which makes the carrier issuing a bill of lading responsible for safe carriage through to destination.

The Maryland Court of Appeals holds that the Public Service Commission of the state has no authority to regulate the issuance of securities by the Baltimore & Ohio Railroad beyond passing on the question whether they are issued in proper form and in good faith. Suit had been instituted to sustain the authority of the commission to determine the aggregate amount of capital stock which might be issued and also the aggregate of bonded indebtedness; also the price at which stock or bonds should be sold and what disposition should be made of the proceeds.

The Supreme Court of the United States has refused a rehearing in the Minehill Corporation tax case, in which it was decided that a corporation engaged only in leasing its property and investing its funds was not "doing business," and therefore was not liable for the tax. The decision exempted hundreds of railroad companies from paying the tax, as well as telegraph and other corporations. Attorney General McReynolds had asked a rehearing on the ground that the decision was in conflict with previous corporation tax decisions of the court and would lead to inequality in the operation of the law. He declared the result would be that any corporation might avoid the tax simply by leasing its plant.

The United States circuit court of appeals at New Orleans has rendered a decision in the case of the United States vs. the Houston Belt & Terminal Company, which holds that the hours-of-service law, regulating the working time of telegraphers, applies to the service of certain towermen. It was charged that the company was working its towermen in 12-hour daily shifts, where the law makes a limit of nine hours; and the railway in defense claimed that the act did not apply to the tower men, because they did not handle train orders. Judge Foster, in delivering the court's opinion, held that the signals or communications transmitted by tower men were to be deemed train orders. "To say that the tower men only used the telephones for giving information not covered by the statute would be the merest sophistry," he said. "It is difficult to perceive how anything could be a more imperative order affecting train movements than for one of the tower men at Houston to notify another that he had started a train and at the same time telling him to hold all traffic in the opposite direction over the same track."

By a decision by Judge W. I. Grubb, of the United States district court for the middle district of Alabama, issued on May 5, the Louisville & Nashville loses its suit to have the Alabama State Railroad Commission declared in contempt of court for ordering a reduction in passenger rates in that state notwithstanding the action of the federal court some months ago, which held a former reduction illegal. The present suit followed the action of the commission in ordering the road to reduce all passenger rates, March 6, to 2½ cents a mile. Judge Grubb says that the railroad company's remedy, if it has one, lies in independent proceedings in the state or federal court, where it can ask for an injunction against the railroad commission. Under the law of the state, the commission has the power to make and enforce railroad rates independent of any legislative act, or any injunction against a legislative act. The rate which the court had declared illegal was 2½ cents a mile, prescribed specifically by a legislative act. The court held that so low a rate would be confiscatory and on the issuance of the decision the road increased fares to the basis of three cents a mile.

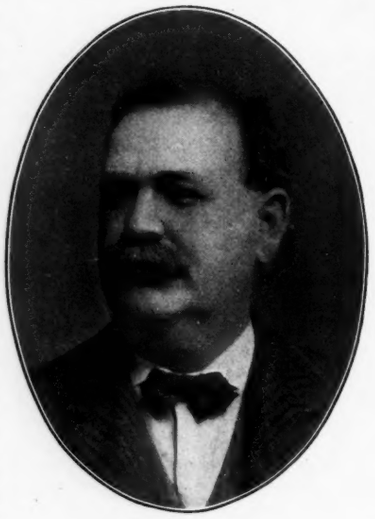
Railway Officers.

Executive, Financial and Legal Officers.

Robert E. Strahorn has resigned as vice-president of the Oregon-Washington Railroad & Navigation Company.

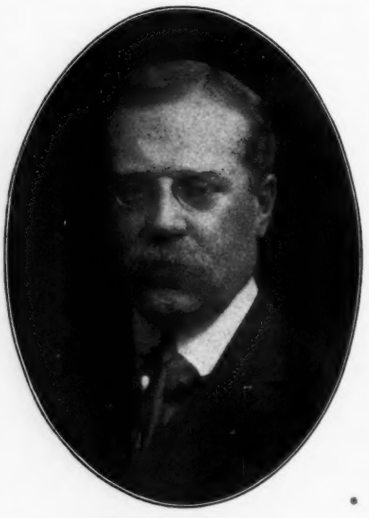
E. J. Dedman, general manager of the Gainesville & Northwestern, has been elected also vice-president, with office at Gainesville, Ga.

Edward Chambers, assistant freight traffic manager of the Atchison, Topeka & Santa Fe Coast Lines, has been elected vice-president, in charge of traffic, with headquarters at Chicago, succeeding George T. Nicholson, deceased. Mr. Chambers was born February 16, 1859, at Waukegan, Ill., and was educated in the public schools. His entire railway service has been with the Atchison, Topeka & Santa Fe system, with which road he began work in November, 1878, as a freight handler on the platform at Pueblo, Colo. He remained at that place until 1885, successively as check clerk, foreman of transfer platform, and cashier. He was then transferred to San Diego, Cal., as local agent, and in 1887 became local agent at Los Angeles, Cal. Seven years later he was promoted to assistant general freight agent at that point; from 1894 to 1896 he was general freight agent, with headquarters at the same place, and then until March, 1905, he was freight traffic manager of the Coast Lines, with office at San Francisco, Cal. He relinquishes the duties of the latter position June 1 to become vice-president of the Santa Fe system, in charge of traffic, as above noted.



E. Chambers.

William V. S. Thorne, director of purchases of the Union Pacific, with office at New York, has been elected vice-president of the Union Pacific, the Oregon Short Line and the Oregon-Washington Railroad & Navigation Company, with headquarters at New York. He was born on March 22, 1865, at Millbrook, N. Y., and graduated from Sheffield Scientific School of Yale University in the class of 1885. The same year he began railway work with the St. Paul, Minneapolis & Manitoba, now a part of the Great Northern, and at various times during the following nine and a half years he was stationed in Minnesota, in South Dakota, in Wisconsin and in Montana, with the engineering department on location and construction work. He was then transferred to the operating department as clerk to the general manager, and subsequently was promoted to assistant purchasing agent, and then to superintendent of the St. Cloud, Minn., shops. His next position was assistant superintendent of the Breckenridge division, and he was later made superintendent of the Eastern Railway of Minnesota division. In 1895 he was elected vice-president and general manager of the Pennsylvania Coal Company, and vice-president of the Erie & Wyoming Valley Railroad, one of its subsidiaries, with headquarters at New York, and soon afterwards was elected president of the Delaware Valley & Kingston Railway, a company which was formed to build a railroad along the route of the old Delaware & Hudson canal from Hawley, Pa., to Kingston, N. Y. These three properties were sold to the Erie Railroad in 1900. In the summer of 1902 he was appointed assistant to E. H. Harriman, of the Southern Pacific and Union Pacific systems, and the following year was made director of purchases of both systems. In consequence of the order of the Supreme Court, separating the Union Pacific and the Southern Pacific, he resigned on January 31, 1913, as director of purchases of the Southern Pacific, remaining with the Union Pacific.



W. V. S. Thorne.

John M. Metheany has been elected secretary and auditor of the Grand Rapids & Indiana, with headquarters at Grand Rapids, Mich., succeeding R. R. Metheany, deceased.

Daniel Breck has been appointed vice-president of the Missouri, Oklahoma & Gulf, in charge of the operating department and traffic, with headquarters at Muskogee, Okla., succeeding J. W. Hoffman.

C. C. Barry, auditor of Morgan's Louisiana & Texas Railroad & Steamship Company and the Iberia & Vermillion, secretary and auditor of the Lake Charles & Northern, and auditor and assistant secretary of the Louisiana Western with headquarters at New Orleans, La., has been appointed assistant comptroller of the Southern Pacific Company with headquarters at New York, and H. S. Walker succeeds Mr. Barry with headquarters at New Orleans.

Operating Officers.

J. M. Boyd, assistant general air brake inspector of the Northern Pacific, has been appointed trainmaster of the Fargo division, with office at Dilworth, Minn.

H. W. Stanley, assistant general manager of the Seaboard Air Line, with office at Portsmouth, Va., has been appointed general manager, effective May 15.

F. M. Smith, roadmaster of the Seattle division of the Northern Pacific, has been appointed assistant trainmaster of the Seattle division on line north of Seattle, with office at Seattle, Wash.

F. C. Noessel, chief despatcher of the Kansas City, Mexico & Orient of Texas, at San Angelo, Tex., has been appointed trainmaster, with headquarters at San Angelo, and A. J. Cleary succeeds Mr. Noessel.

G. L. Hickey, assistant division superintendent of the Southern Pacific at Tucson, Ariz., has been appointed assistant superintendent of the Montana division of the Oregon Short Line, with headquarters at Pocatello, Idaho, succeeding George Baker, assigned to other duties.

A change in the organization of the New York, New Haven & Hartford and the Central New England went into effect on May 1, and C. L. Bardo, general manager, is now in charge of all matters pertaining to transportation, maintenance of equipment, power stations, high tension lines, track signals, bridges and buildings. The engineer of maintenance of way, the general superintendent, the mechanical superintendent, the electrical superintendent, the signal engineer, the superintendent of telegraph, the contract agent and the superintendent of dining cars will report to the general manager. H. Gilliam, electric superintendent of the New York, New Haven & Hartford at Stamford, Conn., will have charge of and be responsible for the maintenance, distribution and control of all electrical apparatus and high tension wires from the crossarms outside of the switchhouse to the shoes of the locomotives, which includes the high tension primaries of all transformers and switches connected to the distributing system. On all matters pertaining to operation he will report to the division superintendent. He will also act in an advisory capacity for all high tension lines heretofore maintained by the signal engineer, including direct current line between Providence and Fall River, Warreen and Bristol, Nantasket Junction and Pemberton.

George F. Dickson, whose appointment as superintendent of the Georgia & Florida, with headquarters at Douglas, Ga., has been announced in these columns, was born on December 1, 1872, at Lake Waccamaw, N. C., and was educated in the common schools. He began railway work in July, 1891, with the Plant System of railways as a telegraph operator, and in 1896 was promoted to train despatcher, becoming chief despatcher in 1901. He remained in the service of that system and its successor, the Atlantic Coast Line, until 1905, and then became trainmaster on the Atlanta, Birmingham & Atlantic. In April, 1912, he went to the Georgia & Florida, as trainmaster, which position he held at the time of his appointment on April 15, as superintendent of the same road, with headquarters at Douglas, Ga., as above noted.

G. F. Dickson.

Traffic Officers.

L. G. Paul, traveling passenger agent of the Baltimore & Ohio Southwestern, with headquarters at St. Louis, Mo., has been appointed division passenger agent at Chillicothe, Ohio, succeeding L. B. Jay.

Harry V. Wilmot has been appointed district passenger agent of the Northern Pacific at Milwaukee, Wis., in place of M. E. Harlan, who has been promoted to a position in the traffic department at St. Paul, Minn.

W. E. Phillips has been appointed traveling freight agent of the Toledo, St. Louis & Western, succeeding K. W. Curtis, resigned, and H. R. Mason has been appointed traveling freight agent, both with offices at Pittsburgh, Pa.

F. R. Clark, traveling freight agent in the office of the division freight agent of the Grand Trunk at Toronto, Ont., has been promoted to traveling freight agent in the office of the assistant foreign freight agent, with headquarters at Toronto, and F. G. Gould succeeds Mr. Clark.

H. C. Stevenson, traveling passenger and freight agent of the Baltimore & Ohio Southwestern, with headquarters at Denver, Colo., has been appointed southwestern passenger agent, with office at Dallas, Tex., succeeding W. F. Geisert, who takes Mr. Stevenson's place at Denver.

L. B. Jay, division passenger agent of the Baltimore & Ohio Southwestern at Chillicothe, Ohio, has been appointed district passenger agent of the Cincinnati, Hamilton & Dayton, with office at Indianapolis, Ind., in place of H. G. Alexander, who takes service with the Chicago, Indianapolis & Louisville.

G. W. Housley having resigned as general agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Hot Springs, Ark., all matters pertaining to freight traffic will be handled by R. M. McWilliams, assistant general freight agent, and that regarding passenger business by F. E. Schroeder, assistant general passenger agent, whose headquarters are at Little Rock, Ark.

H. J. Booth, formerly general coal and ore agent of the Wheeling & Lake Erie, has been appointed special agent in connection with the traffic department of that road and traffic manager of the Lorain & West Virginia, with headquarters at Cleveland, Ohio. Mr. Booth recently was granted a leave of absence. R. F. Smith, commercial agent of the former road at Cleveland, Ohio, has been appointed commercial agent; A. O. Ellis, traveling passenger agent, with headquarters at Canton, Ohio, is appointed traveling freight agent also; Charles Schoch has been appointed contracting freight agent, and E. D. Shenk has been appointed commercial agent at Cleveland.

Engineering and Rolling Stock Officers.

B. H. Allmain has been appointed roadmaster of the Seattle division of the Northern Pacific, with headquarters at Seattle, Wash., succeeding F. M. Smith, promoted.

H. F. Grewe, general foreman of the mechanical department of the Wabash-Pittsburgh Terminal and the West Side Belt, at Carnegie, Pa., has been appointed master mechanic in charge of locomotive and car departments of both companies, with headquarters at Rook (Carnegie, Pa.).

P. Alquist, chief inspector of the car department of the Pere Marquette at Detroit, Mich., has been appointed superintendent of the car department of the Missouri, Kansas & Texas, with headquarters at Sedalia, Mo., succeeding W. A. Mitchell, whose title was master car builder, and which office has been abolished.

T. R. Stewart, who has been appointed master mechanic of the Baltimore & Ohio, at Cumberland, Md., as has been announced in these columns, began railway work with the Baltimore & Ohio in September, 1886. He was consecutively boilermaker, foreman, roundhouse foreman and general foreman until February, 1904, when he was appointed master mechanic, and is now transferred in the same capacity from the Riverside shops, Baltimore, Md., to Cumberland, as above noted.

F. H. Hanson, supervisor of materials of the Lake Shore & Michigan Southern, and the Chicago, Indiana & Southern, at Cleveland, Ohio, has been appointed assistant master car builder of the Lake Shore division of the Lake Shore & Michigan Southern and the Dunkirk, Allegheny Valley & Pittsburgh, with headquarters at Collinwood shops, Ohio, and H. W. Gardner has been appointed supervisor of materials of the Lake Shore & Michigan Southern, with headquarters at Cleveland, succeeding Mr. Hanson.

P. Coniff, who has been appointed superintendent of shops of the Baltimore & Ohio, at Mount Clare, Baltimore, Md., as has been announced in these columns, began railroad work in 1888. He was a machinist on the Pittsburgh & Lake Erie, the Pittsburgh, Fort Wayne & Chicago and the St. Louis, Iron Mountain & Southern railroads until December, 1902, when he entered the service of the Baltimore & Ohio as a roundhouse foreman. He later became general shop foreman, and was promoted to master mechanic at Cumberland, Md., on May 1, 1911, which position he held at the time of his recent promotion as superintendent of shops of the same road, as above noted.

J. Kirkpatrick, who has been appointed master mechanic of the Baltimore & Ohio, at the Riverside shops, Baltimore, Md., as has been announced in these columns, served his machinist apprenticeship with the Kingston (Ontario) Locomotive Works from 1878 to 1882, and was later connected with the Canadian Pacific, the South Eastern and the Grand Trunk railways. He entered the service of the Baltimore & Ohio in March, 1903, and was promoted to master mechanic in the New Castle, Pa., shops in August, 1903, remaining in that position until 1905, when he was transferred to Cumberland in the same capacity. In February, 1907, he went to the Newark, Ohio, shops as master mechanic, and now goes to the Riverside shops of the same road.

J. Kirkpatrick.

J. F. Bowden, who becomes master mechanic of the Baltimore & Ohio at Newark, Ohio, as has been announced in these columns, served his apprenticeship in the Baltimore & Ohio shops at Keyser, W. Va., starting in March, 1885. He became roundhouse foreman at Grafton in September, 1895, and general fore-

man at Washington, D. C., November 1, 1898. He was then general foreman at Cumberland, Md., and at Benwood, W. Va., and was appointed master mechanic at Parkersburg, W. Va., in September, 1907. He was transferred in the same capacity to Garrett, Ind., on December 1, 1908, and now becomes master mechanic of the same road at Newark, Ohio, as above noted.

F. W. Rhuark, whose appointment as master mechanic of the Baltimore & Ohio, at Garrett, Ind., has been announced in these columns, began railway work as a water boy with the Baltimore & Ohio in June, 1879. He was then a machinist with the Lake Shore, the Toledo & Ohio Central and the Chicago & Alton railroads. In 1893 he became road foreman of engines of the Baltimore & Ohio, and was later in the service of the Big Four, the Erie and the St. Louis & San Francisco railroads. He was appointed machine shop foreman of the Baltimore & Ohio in January, 1906, and then was successively general foreman and motive power inspector until December 1, 1910, when he was appointed master mechanic at Lorain, Ohio, and is now transferred in the same capacity to Garrett, Ind.

R. A. Rutledge, whose appointment as chief engineer of eastern lines of the Atchison, Topeka & Santa Fe has already been announced, was born December 13, 1863, at Jamestown, Pa. He attended the University of Kansas from 1884 to 1891, and began railway work August 1, 1892, with the Gulf, Colorado & Santa Fe. From 1894 to 1896 he was city engineer at Florence, Colo., and county supervisor of Fremont County, Colo., and was then until June 15, 1897, surveyor U. S. Department of Mines at Cripple Creek District, Colo. He returned to railway service on the latter date as instrumentman for the Gulf, Colorado & Santa Fe. On December 1 of the following year he was made assistant engineer, and from October, 1904, to January, 1910, was resident engineer of the same road. He was then promoted to assistant chief engineer of that road, with headquarters at Galveston, Tex., which position he held until he was appointed chief engineer of the eastern lines of the Santa Fe, with office at Topeka, Kan., as above noted.

F. M. Bisbee, who recently was appointed chief engineer of the Western Lines of the Atchison, Topeka & Santa Fe, with headquarters at Amarillo, Tex., was born September 27, 1855, at Brunswick, Me. He was educated at the University of Maine, and began railway work in 1878 with the Atchison, Topeka & Santa Fe as rodman. Later he was transitman, and subsequently went to the Mexican Central as superintendent of construction, afterwards returning to the Santa Fe as superintendent of tracklaying. He was then made superintendent of track, bridges and buildings of the Gulf, Colorado & Santa Fe, and later until October, 1896, was superintendent of track, bridges and buildings of the St. Louis & San Francisco. From October, 1896, to July, 1900, Mr. Bisbee was general manager and chief engineer of the Tennessee Central, and from January, 1901, to July, 1903 he was general manager of the Los Angeles Land & Water Company. He was then until 1904 engineer for B. Lantry & Sons, railroad contractors, at Ft. Madison, Iowa. In July, 1904, he became engineer of the Western lines of the Atchison, Topeka & Santa Fe at La Junta, Colo., which position he held until he was promoted to chief engineer of those lines, as above noted.

The authority of G. W. Wildin, mechanical superintendent of the New York, New Haven & Hartford, with office at New Haven, Conn., has been extended over the Central New England; and (on the New Haven) he has been put in charge of the maintenance of electric locomotives or multiple unit cars, and the operation and maintenance of power stations up to and including the lines at the crossarms outside of the switch house. George O. Hammond has been appointed assistant mechanical superintendent of the New York, New Haven & Hartford, and the position of assistant to the mechanical superintendent has been abolished. H. C. Oviatt, general inspector at New Haven, has been appointed assistant mechanical superintendent, and the position of general inspector has been abolished. J. L. Crouse has been appointed superintendent of shops, Electric division, reporting to the mechanical superintendent, with headquarters at Van Nest, N. Y. Joseph McCabe, division master mechanic at Waterbury, Conn., has been appointed master mechanic of the Shore Line division, with office at Harlem River, N. Y., to have jurisdiction over matters west of New Haven. C. H. Reid, general road foreman of engines, has been appointed master mechanic of the Western division, with office at Waterbury, Conn., succeeding Mr. McCabe, and F. W. Nelson, road foreman of engines, Western division, has been appointed general road foreman of engines, with office at New Haven, succeeding Mr. Reid.

The following changes in organization on the New York, New Haven & Hartford, and the Central New England were made effective May 1: E. Gagel, chief engineer, has been given charge of the engineering department and will have jurisdiction over all matters pertaining to construction and standards. The authority of W. J. Backes, engineer of maintenance of way of the New York, New Haven & Hartford, with office at New Haven, Conn., has been extended over the Central New England. He will have charge of tracks, bridges, buildings and signals. Division superintendents will report to the engineer of maintenance of way, on all matters coming within his jurisdiction. Division engineers will report to and receive instructions from the division superintendents. They will have charge of and be responsible for the safe maintenance of tracks, bridges, buildings and signals, and will take over such men as may be assigned from the bridge, building and signal departments. They will report to the engineer of maintenance of way, on matters pertaining to inspection of physical property, construction and standards of maintenance, other than signal standards, on which they will report to the signal engineeer. G. A. Rodman, inspector of bridges and buildings at New Haven, Conn., has been appointed general supervisor of bridges and buildings, in charge of the inspection of all bridge and building work to be done by the maintenance of way department, with office at New Haven. He will report to the engineer of maintenance of way. The office of superintendent of bridges and buildings has been abolished, and the duties heretofore performed by the superintendent of bridges and buildings are assigned to division engineers. I. D. Waterman, engineer of construction at New Haven, has been appointed construction engineer in general charge of construction work. A. S. Tuttle, division engineer of construction at Boston, Mass., has been appointed construction engineer in charge of grade crossing eliminations in the state of Massachusetts, and such other work as may be assigned to him. C. W. Lord has been appointed office engineer at New Haven, in general charge of office drafting department, and such other matters as may be assigned to him. W. H. Moore, engineer of bridges at New Haven, has been appointed engineer of structures, and will have charge of the design of all bridges and structures. L. J. Carmalt, assistant chief engineer of the Central New England, at Hartford, has been appointed construction engineer in charge of work on the Central New England, and will perform such other duties as may be assigned to him. The office of assistant chief engineer of the Central New England has been abolished.

OBITUARY.

Peter E. Bowman, formerly superintendent of the New York division of the New York, New Haven & Hartford, died on May 9, at his home in New Haven, Conn., at the age of 65.

Clarence Deming, for 15 years, until 1912, an editorial writer on the *Railway Age Gazette*, died at his home in New Haven, Conn., May 8, at the age of 65. Mr. Deming was born at Litchfield, Conn., and was graduated from Yale College in 1872. He had been a journalist throughout his active life, and as such had traveled in many countries for the New York *Evening Post*. He was for several years an editorial writer on that paper. He was a man of broad culture and looked at railroad and economic topics, as at all other affairs, from a high plane of moral integrity. His personality was perennially pleasant, so that his acquaintances—all who really knew him—esteemed him for his lovable qualities as well as for his ability as an investigator and his courage as an upholder of righteousness in public affairs. Mr. Deming is survived by his wife, one son and two daughters.

LOAN FOR BOLIVIAN RAILWAY.—The Bolivian government has received information from its agent in Paris that he has placed a loan for $7,500,000 for the construction of the railway from Quiaca to Tupiza which would join up at the former station with the Central Northern system.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Charlotte Harbor & Northern has ordered 2 consolidation locomotives from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 26 in., and the diameter of the driving wheels will be 54 in.

The Amaga Railroad, Colombia, has ordered 2 prairie type locomotives from the American Locomotive Company. The dimensions of the cylinders will be 12 in. x 16 in.; the diameter of the driving wheels will be 33 in., and the total weight in working order will be 62,000 lbs.

The Chicago, Rock Island & Pacific has ordered 2 mountain type passenger locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 28 in. x 28 in. cylinders, 69 in. driving wheels, and in working order will weigh 328,000 lbs.

The Aluminum Company of America has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 20 in. x 26 in.; the diameter of the driving wheels will be 50 in., and the total weight in working order will be 144,000 lbs.

The Solvay Process Company, Syracuse, N. Y., has ordered 1 six-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 19 in. x 24 in.; the diameter of the driving wheels will be 51 in., and the total weight in working order will be 122,000 lbs.

CAR BUILDING.

The Erie is considering the purchase of 5,000 freight cars.

The Baltimore & Ohio has ordered 500 gondola cars from the Cambria Steel Company; 40 baggage cars from the American Car & Foundry Company; and 5 seventy-foot combination baggage and mail cars, 7 fifty-foot combination passenger and baggage cars, 25 seventy-foot coaches, 15 sixty-foot smoking cars and 4 seventy-three-foot dining cars from the Pullman Company.

IRON AND STEEL.

The Baltimore & Ohio has ordered 1,300 tons of rails from the Maryland Steel Company.

General Conditions in Steel.—There has been but little change in the steel industry during the past week. The mills continue to operate at as near their full capacity as possible and the volume of new orders is still very light. Manufacturers feel that consumers will be forced to place large orders before very long, and consequently are not contemplating any price reduction. If the crops are successful, and present indications suggest that they will be, there will be a decided improvement in the buying movement. During April the average volume of new business placed daily was not much over 26,000 tons, comparing with more than 40,000 tons in March and between 45,000 and 50,000 tons a day in the corresponding period of last year.

SIGNALING.

The Chicago, Lake Shore & South Bend is to install automatic block signals throughout the length of its line—70 miles. This is an electric line from South Bend, Ind., westward toward Chicago. The company had been ordered by the Indiana Railroad Commission to install signals on 12 miles of its line, but has concluded that the whole road should have this improvement. The plans provide for the use of "light" signals.

Plans for Brazilian Railway Approved.—The President of Brazil has signed a decree approving definite plans and estimates amounting to $1,100,000 for the railway line between kilometer 0 to 105 of the Coroata to Tocatins Railway.

Supply Trade News.

Charles R. Westcott has been elected secretary and treasurer of the M-C-B Company, Chicago.

The E. D. E. Company, Chicago, Ill., has moved its offices from 1449 to 1402-1404 Railway Exchange building.

The Railway Utility Company has removed its office from the Monadnock building to 226 South LaSalle street, Chicago.

The Baldwin Locomotive Works is preparing to begin construction on the first unit of its new plant at East Chicago, Ind., for which approximately 370 acres of land was purchased last year.

The Hall Switch & Signal Company, New York, has acquired the patent rights formerly owned by the General Railway Equipment Company, the United States Electric Company and the Sandwich Electric Company, and will hereafter make and sell Gill selectors, Sandwich selectors and other apparatus and equipment formerly handled by those companies.

The White Enamel Refrigerator Company, St. Paul, Minn., has closed a contract with the Grand Trunk for 32 large refrigerators to be installed in the new $2,000,000 Fort Gary Hotel at Winnipeg. The contract amounts to approximately $30,000. This company also furnished the refrigerator equipment for the Chateau Laurier and the Central Union station at Ottawa, Ont.

The Power Specialty Company, New York, is building a new erecting shop, at its works at Dansville, N. Y., to handle the increasing demand for Foster superheaters. This shop will be 300 ft. x 96 ft., and will be completed in about two months. This company has recently received orders for Foster superheaters from the Jones & Laughlin Steel Company, Pittsburgh, Pa.; the Brier Hill Steel Company, Youngstown, Ohio; the Rhode Island Company, Providence, R. I., and the Havana Electric Railway Light & Power Company, Havana, Cuba.

The Railroad Supply Company, Chicago, has announced a reorganization of its signal department, under which J. M. Fitz Gerald, now engineer maintenance of signals of the New York Central & Hudson River, becomes general manager of the signal department, effective on May 20, with headquarters in the Bedford building, Chicago. Mr. Fitz Gerald entered the motive power department of the Boston & Albany in June, 1902, and later became mechanical engineer and signal engineer of that road. In March, 1910, he was appointed assistant signal engineer of the New York Central, and on April 1, 1911, engineer maintenance of signals.

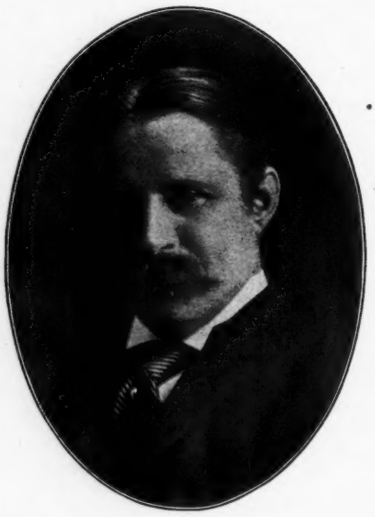
Willis E. Holloway and Paul W. Holstein have resigned their positions with the Jeffrey Manufacturing Company, Columbus, Ohio, to go to the Roberts & Schaefer Company, Chicago. Mr. Holloway has been with the Jeffrey company for nine years. He will have charge of the marketing of the new Marcus combination screen and picking conveyor which the Roberts & Schaefer Company has recently acquired. Mr. Holstein has been associated with the Jeffrey company for the past 21 years. During a large portion of this time he was contracting engineer on coal tipple and coal washing plant construction. He will have charge of this branch of the Roberts & Schaefer Company's business, principally in the West Virginia field.

P. G. Jenks has been made assistant to the president of the Standard Steel Car Company, Pittsburgh, Pa., with office at Chicago. Mr. Jenks started in the office of the Schoen Pressed Steel Company at Pittsburgh in 1899, and in 1902 was made treasurer of its successor, the Pressed Steel Car Company, Pittsburgh, Pa. From 1907 to 1909 he was manager of the Western Steel Car & Foundry Company, Chicago, with office in that city. From 1909 to May 1, 1913, he was a partner in the steel and pig iron firm of Banning, Cooper & Company, Ltd., Pittsburgh, Pa., which position he has resigned to go to the Standard Steel Car Company, as mentioned above. Mr. Jenks is a brother of C. D. Jenks, vice-president of E. S. Woods & Co., Chicago.

The General Electric Company, Schenectady, N. Y., has received among recent orders the following: Six 200 h. p., four-

motor, locomotive equipments, twenty 140 h. p., four-motor car equipments, and fifty-two 60 h. p. railway motors for the St. Louis, Springfield & Peoria; one 1,325 k. v. a. motor generator set and switchboard apparatus for the Northwestern Pacific for installation at its Alto power house, near Sausalito, Cal.; nine 150 k. v. a. transformers, six 200 k. v. a. reactances, two 200 k. w. induction motor driven exciters and switchboard apparatus for the Rhode Island Company, Providence, R. I; two 100 h. p four-motor car equipments, and three Sprague General Electric multiple unit trailer car equipments for the Norfolk Southern; and thirty-six 60 h. p., two-motor car equipments for the Southern Pacific. M. F. Westover, Schenectady, and I. S. Keeler and C. P. Moore, both of New York, have been elected directors of this company.

Robert Roberts Bishop, for the past 25 years representative of L. C. Chase & Co., Boston, Mass., maker of Chase goat brand mohair car plushes, died at Mount Clemens, Mich., on May 5, at the age of 55. At the time of his death his office was at Detroit, Mich. Mr. Bishop was born at Holliston, Mass., in 1858. He prepared for college at a Boston private school, and was graduated from Harvard University with the class of 1880, among his classmates being Theodore Roosevelt and Robert Bacon. In 1888 he went to L. C. Chase & Co., as a representative in the sales department. He retained this position until the time of his death. While his unusual zeal, conscientious thoroughness and business ability were generally recognized, his fine qualities as a man stood out in even higher degree. He had many friends in the railway and supply business.



Robert R. Bishop.

W. P. Hawley, whose election to the vice-presidency of the United States Light & Heating Company, New York, has been announced in these columns, was born in Chatham, N. Y., August 1, 1883. He received a high school education at that place, and after graduation worked in the state bank for five years. In September, 1904, he left Chatham and came to New York. He entered the service of the Manhattan Lighterage Transportation Company, which was sold to the Central Railroad of New Jersey on January 1, 1905. On that date Mr. Hawley took a position with the United States Light & Heating Company of New Jersey. Upon the consolidation of the United States Light & Heating Company of New Jersey, the Bliss Car Lighting Company, Milwaukee, Wis., and the National Battery Company, Buffalo, N. Y., under the name of the United States Light & Heating Company, of Maine, Mr. Hawley was made manager of the New York office, which position he still holds in addition to his duties as vice-president.

W. P. Hawley.

C. A. Seley, formerly mechanical engineer of the Chicago, Rock Island & Pacific, announces the organization this week in Pittsburgh of the American Flexible Bolt Company. It will manufacture locomotive staybolts and other bolts, embodying a new method of construction invented and developed by Ethan I. Dodds, formerly connected with the Erie Railroad, Pullman Company, etc. The preliminary tests and experiments have resulted so satisfactorily that the company organization has been effected and will actively enter the commercial field. The general offices are in the Union Bank building, Fourth and Wood streets, Pittsburgh, Pa. The shops are at Zelienople, Pa., thirty-two miles west of Pittsburgh, on the main lines of the B. & O., B. R. & P., and the Harmony Trolley Line, an excellent shipping and manufacturing point. Machinery for a very considerable production has been installed and is in operation, and the property of the company will permit convenient expansion as the business is developed. The officers are: C. A. Seley, president; J. A. Frauenheim, vice-president and general manager; H. T. Frauenheim, secretary and treasurer; Ethan I. Dodds, chief engineer.

TRADE PUBLICATIONS.

Unions.—The Jefferson Union Company, Lexington, Mass., has devoted a small illustrated folder to a brief historical sketch of Benjamin Franklin and to the efficiency of Jefferson unions.

Hydraulic Speed Gears.—The Waterbury Tool Company, Waterbury, Conn., has published an illustrated booklet entitled The Waterbury Hydraulic Speed Gear, furnishing illustrations and full descriptions of these gears and including diagrams and tables.

Speed Recorders.—The Chicago Pneumatic Tool Company has issued a booklet containing full descriptions and illustrations of the Boyer railway speed recorder, together with detailed instructions for applying and operating the apparatus, and a catalog of repair parts.

Locomotive Cranes and Grab Buckets.—The Orton & Steinbrenner Company, Chicago, Ill., has issued an attractive illustrated booklet describing its locomotive cranes, drag line excavators, clam shell buckets, coal crushers, electric and steam hoists, and other elevating and conveying machinery.

Oxy-Acetylene Welding and Cutting.—The Davis-Bournonville Company, New York, has published an attractive illustrated booklet on oxy-acetylene welding and cutting apparatus. This booklet contains illustrations and descriptions of the various types of equipment, and shows the layout of several types of generating and compressing plants.

Waterproofing Cement Products.—The Chicago Ironite Waterproofing Company, Chicago, has devoted several illustrated booklets to ironite, a metallic waterproofing for all sorts of cement products. Ironite is designed to overcome the drawback to the porosity of cement products. These booklets include general descriptions, testimonials and specifications and tests.

Flexible Couplings.—The Francke Company, New Brunswick, N. J., has devoted bulletin No. 18 to Francke flexible couplings for direct connecting steam and gas engines, steam and water turbines, etc. The bulletin is illustrated and includes dimension tables and price lists. Inquiries should be addressed to the Smith-Farrell Company, Inc., general sales agents, 90 West street, New York.

Fuel Economy.—The Valley Iron Works, Williamsport, Pa., has published an interesting illustrated booklet entitled The Economical Burning of Coal. It gives a treatise on how coal can be burned to insure greatest economy, smoke prevention, etc., with hand firing. Illustrations and descriptions of the different grates made by this company, including the Ajax shaking and Ajax dumping grates, are also given.

Postal Car Lighting.—The Safety Car Heating & Lighting Company, 2 Rector street, New York, has issued a 30 page booklet dealing with the requirements of postal car lighting as specified by the United States government. Floor plans of full postal and apartment cars are included, showing the lamp locations, and illustrations and tables of this company's recommended lamps and fixtures for postal cars are given.

Railway Construction.

ASHERTON & GULF.—According to press reports plans are being made to build the extension from Asherton, Tex., west to Eagle Pass, about 50 miles. The line may eventually be further extended up the valley of the Rio Grande to Del Rio, an additional 50 miles. It is understood that negotiations are pending for extending the line from Asherton Junction east to a point on the gulf coast either at Corpus Christi or at Rockport. (March 14, p. 528.)

BOSTON & MAINE.—See an item in General News regarding the completion of the Hampden Railroad from Bondville, Mass., to Springfield, 16 miles, also the new line from South Vernon, Vt., north to Brattleboro, to be opened for business on June 23.

CANADIAN NORTHERN.—A line has been located between Parry Sound, Ont., and Callander. The route is from a point on the Toronto-Sudbury branch at mile 170, northeasterly through Whitestone, Golden Valley, Restoule and Nipissing to Callander, where connection is to be made with the main transcontinental line. The new line will cross the Whitestone, the Maganatawan, the Pickerel, the South and the Wistiwasing rivers, also Commanda creek. At the crossing of the Maganatawan river, there will be a deck span bridge 100 ft. long and 45 ft. high, with about 300 ft. of trestle approaches, and over South river there will be a bridge 300 ft. long and 25 ft. high. Construction work on the line will not be carried out this year.

CANADIAN PACIFIC.—An officer writes that the company has made surveys for a line from Metaline, Wash., to Trail, B. C., also for an extension of the Crows Nest Pass line west, but nothing definite has been decided as to building these lines.

CHICAGO & NORTH WESTERN.—See South Dakota Roads.

FOSTORIA & FREMONT (Electric).—This company, which operates the line from Fremont, Ohio, southwest to Fostoria, is making surveys, it is said, for an extension over two routes to Port Clinton. One survey is being made from Fremont north to Oak Harbor, thence east to Port Clinton, and the other from Fremont northeast to Port Clinton.

GRAFTON, FAIRMONT & CLARKSBURG TRACTION.—According to press reports this company which was organized some time ago to build from Grafton, W. Va., west via Pruntytown, to Meadland, thence north via Boothsville to Fairmont, 32 miles, with a branch from Boothsville southwest to Bridgeport, 7 miles, will ask for bids at once for work on the section between Grafton and Pruntytown. George R. Kirk, president; J. W. Kirk, general manager, and J. W. Roberts, chief engineer, Grafton.

GRAND MARAIS & NORTHWESTERN.—Incorporated in Minnesota to build from Grand Marais west to a connection with the Duluth & Northern Minnesota, about 50 miles, and to build branch lines. A proposition has been submitted by the promoters to the voters of Cook county asking for $100,000 in aid of the project. A. Mitchell, president, and J. Jenswold, secretary, Duluth.

GRAND RAPIDS & NORTHWESTERN.—A contract for the construction of the line from Ludington to Grand Rapids, Mich., has been awarded to the J. H. Flick Construction Company, Chicago, and actual construction work is to be started at once. J. N. Tittemore, Chicago, is president.

HAMPDEN RAILROAD.—See Boston & Maine.

HOUSTON & BRAZOS VALLEY.—According to press reports work has been started on an extension from Freeport, Tex., to Bryan Heights, where the mines of the Freeport Sulphur Company are located, about three miles. (March 14, p. 529.)

LEHIGH & NEW ENGLAND.—A contract has been given to the Reed Construction Company, it is said, to build a five-mile spur line south to Bath, Pa.

MEMPHIS, DALLAS & GULF.—According to press reports grading work and track laying is to be started at once to complete the extension north to Hot Springs, Ark.

MINNESOTA, DAKOTA & WESTERN.—An officer writes that a contract has been let to M. W. Barnard, Minneapolis, Minn., to build an extension of the Deer river branch, 10 miles south, and the work is now being carried out by Olson & Tully. The clearing is nearly completed, and grading has been started. It is expected that the improvements will be finished by September of this year. A contract has also been let to Fred Smith, Laurel, for extending the Loman branch, west across Black river, two miles, on which work is to be started this month. This includes all the construction work that the company expects to carry out during 1913.

MONTREAL & SOUTHERN COUNTIES (Electric).—An officer writes that the present track extends from Montreal, Que., through St. Lambert to Longueuil, 7 miles, and from St. Lambert to Golf Club, 1½ miles. New track is being laid from Golf Club to the Central Vermont Railway, 2½ miles, and the Central Vermont is to be electrified to Richelieu, 15 miles. It is expected that the section from Gold Club to Richelieu will be opened for operation early in May and that the Central Vermont electrification from Richelieu to St. Cesaire, 15 miles, will be completed this year. Surveys for an extension from St. Cesaire, via Abbotsford, to Granby, 16 miles, have been made, but it has not yet been decided when contracts for the work will be let. There will be one 200 ft. steel truss bridge, and three trestles. A station will be built at Abbotsford, and substations will be built at Abbotsford and at Granby. The company expects to develop a traffic in dairy products, fruit, coal and farm products. Work on a branch south to La Prairie and on the extensions will probably be started next year. (December 20, p. 1235.)

OGDEN, LEWISTON & NORTHERN (Electric).—According to press reports this company will begin work this summer on a line from Ogden, Utah, north to Preston, Idaho, about 65 miles. The company was recently incorporated at Salt Lake City, Utah.

OREGON RAILROAD.—According to press reports contracts are to be let soon to build a section of this line. The company was organized in February with a capital of $500,000, to build from Salem, Ore., southeast via Stayton and Minto to Bend, about 115 miles. The incorporators include G. A. Kyle, J. N. Mounce and A. L. McCloud. J. H. McNary, Salem, is attorney.

PARIS & MT. PLEASANT.—An officer writes regarding the reports that an extension is to be built from Paris, Tex., to Atoka, Okla., and into the Lehigh coal fields, that nothing definite has yet been decided as to this extension, and surveys for such a line have not yet been made. The company has completed the line from Mt. Pleasant to Bogata, 32 miles, and regular service will be started by June 1. (May 2, p. 1013.)

SOUTH DAKOTA INTERURBAN.—Work on a section of this electric line it is thought will soon be started. The company was organized several years ago to operate a line with branches from Sioux City, Iowa, into South Dakota, across the counties of Union, Clay, Lincoln, Turner, Yankton, Hutchinson Davison, Douglas, Charles Mix, Aurora and Brule, about 200 miles. W. E. Miller, Sioux City, has been securing right of way in South Dakota for a long time and has succeeded in getting a loan of $5,000,000, through the Farmers' Loan Company of Sioux City, upon the property already acquired and to be secured through the proceeds of the loan.

SOUTH DAKOTA ROADS.—Residents of the town of Wood in Mellette county, S. Dak., are now securing a right of way for a line west from Winner, the present terminus of the Chicago & North Western "Rosebud Line." It is understood that if the right of way is secured, the C. & N. W. will build an extension of about forty miles to Wood.

STOCKTON TERMINAL & EASTERN.—An officer of this company, which operates a line from Stockton, Cal., northeast via Linden to Bellota, 18 miles, writes that work is now under way by the company's men, building on Union street, Stockton, from the present terminus to Stockton channel.

TABER TRANSIT.—An officer writes that contracts are to be let in a few weeks to build from Taber, Alta., north to the coal mines at Retlaw and at Bow City. The work will be mostly earth work, with about 20,000 cu. yds. of solid rock work. The approximate cut per mile will be 5,000 cu. yds., and the approximate fill about 7,000 cu. yds. The maximum grades will be 1.9 per cent. and the maximum curvature 10 degrees. There will be one steel bridge 420 ft. long, and eight short pile trestles. The plans also include putting up four stations; twelve freight sheds; car barns and office buildings. The company expects to develop

a traffic in coal and grain. J. F. Kramer, president, and V. O. Eastland, chief engineer, Calgary. (Apr. 18, p. 925.)

Texas Roads.—According to press reports a contract has been entered into between J. Fry, representing the Empire Construction Company, Omaha, Neb., and the commercial club of Big Springs, Tex., for the construction of a railroad from Tucumcari, N. M., to San Antonio, Tex., over 600 miles. The contract provides that Big Springs is to be made both a passenger and freight division point, also that the main shops and general headquarters will be at that place. Surveys will be started at once and track laying is to be begun before January, 1914.

Toronto, Hamilton & Buffalo.—This company has bids under consideration for building second track from Welland, Ont., to Smithville, 16.5 miles.

Trona Railway.—An officer writes that location has been made for a line from Searles, Cal., on the Southern Pacific in Kern county, northerly and northeasterly to the northwestern corner of San Bernardino county to the place known as Borax Lake or Searles Lake, 32 miles. The company expects to begin construction work in May. The maximum grades will be 2½ per cent., and the maximum curvature 4 deg. The line is being built to carry the output of reduction works, including soda-ash, potash and borax. The company also expects to develop a traffic in ores. Joseph K. Hutchinson, president, Claus Spreckels building, and W. A. Cattell, chief engineer, Foxcroft building, San Francisco.

Willapa Bay & Eastern.—An officer writes that the location is now being made and construction work is expected to be started soon from Lincoln Creek in Lewis county, Wash., west to Raymond and South Bend. The maximum grades will be 1 per cent., and the maximum curvature 4 deg. The company expects to develop a traffic in forest products. J. R. Holman, chief engineer, Seattle, Wash. (April 18, p. 926.)

RAILWAY STRUCTURES.

Keokuk, Iowa.—The Chicago, Rock Island & Pacific is planning the erection of a new freight depot to cost between $40,000 and $50,000.

Montreal, Que.—An officer of the Canadian Pacific writes that the company is building large extensions to the Angus shops, including the following: steel passenger and freight car shops, locomotive shop extension, new bolt and nut shop, power house extension, upholstering shop extension, general office building extension, pattern storage building extension, and maintenance building. The cost of the improvements will be about $500,000. (May 2, p. 1913.)

Saint Clair, Pa.—The Philadelphia & Reading has given contracts to Irwin & Leighton, Philadelphia, for two new car repair shops to be built at St. Clair, Pa. The buildings are to have one story, and will be 45 ft. high. One will be 83 ft. 10 in. wide x 604 ft. 8 in. long, and the other 53 ft. 9 in. wide x 464 ft. 8 in. long. They will be of steel, concrete and brick construction, with steel sashes. Work was started on the improvements on May 13.

Whitestone, Ont.—See Canadian Northern under Railway Construction.

Railroad Construction in German East Africa.—The German line from Dar-es-Salaam on the east coast of German East Africa, to Ujiji on Lake Tanganyika, reached Tabora early in 1912, and on October 1 was 82 miles west thereof; the line will be completed, presumably, early in 1914. The 530 miles of line from the coast to Tabora cost about $20,000,000, or $37,000 per mile. The line from Tabora to Kigoma, a bay on Lake Tanganyika about three miles north of Ujiji, will be 260 miles long, and will probably cost over $42,000 per mile. The completion of this railroad will put Lake Tanganyika, one of the most beautiful lakes in the world, within 20 days of Europe. With the completion of the German and Belgian lines to Lake Tanganyika, rail and steamer service will cross Central Africa from Dar-es-Salaam to the mouth of the Congo on the west coast of Africa.—*Mining and Scientific Press.*

Railway Financial News.

Detroit Southern.—As the holders of outstanding certificates of deposit representing more than 50 per cent. of Detroit Southern division first mortgage 4 per cent. bonds have not filed dissent to the plan of reorganization mentioned in our issue of April 18, 1913, this plan has been declared operative. Bondholders and holders of certificates of deposit will be permitted to share in the reorganization only upon subscribing and paying to the Central Trust Company, New York, $500 for each bond of $1,000 deposited by them. The depositors, on the completion of the reorganization, will, in exchange for each $2,000 of bonds deposited and each $1,000 in cash paid, receive $1,000 in new adjustment mortgage bonds, $2,000 in new preferred stock and $1,000 in new common stock.

Hudson & Manhattan.—Stockholders will vote on May 29 on the question of authorizing the new bond issue mentioned in last week's issue. The reorganization plan has been assented to by the holders of about 99 per cent. of the 4½ per cent. bonds and by holders of 97 per cent. of the stock.

Lake Shore & Michigan Southern.—See New York Central & Hudson River.

Laramie, Hahns Peak & Pacific.—A new committee has been formed, consisting of Eugene J. Fabens, chairman, James W. Greene, Edward B. Carleton and Robert P. Clapp, to represent the first mortgage bondholders. Mr. Greene and Mr. Carleton have resigned from the committee of which Frank D. Pavey was chairman, because they thought that the interests of the first mortgage bondholders and those of the holders of the refunding bonds conflict, and that it is best to separate them. The committee in a circular requests the holders of the first mortgage bonds not to consent to the issuance of the $315,000 receiver's certificates asked for by the Hemphill committee, as mentioned in last week's issue, and advises the bondholders to request the trustees to foreclose the mortgage.

Mexican Northern.—This company has declared a semi-annual dividend of 1½ per cent., comparing with 2 per cent. paid semi-annually from 1910 to 1912 inclusive.

Mobile & Ohio.—The stockholders have authorized the purchase of the St. Louis & Cairo, now leased, and an issue of $3,000,000 Mobile & Ohio, St. Louis division 5 per cent. bonds and a mortgage upon the property purchased to secure the bonds. The St. Louis & Cairo runs from East St. Louis, Ill., to Cairo, 159 miles.

New York Central & Hudson River.—On June 16 stockholders will vote on the question of consenting to a plan for the consolidation of the Lake Shore & Michigan Southern and certain other lines with the New York Central & Hudson River. The New York Central now owns 90 per cent. of the common stock of the Lake Shore & Michigan Southren. This stock is pledged as security for the 3½ per cent. Lake Shore collateral bonds, and before the two companies can be consolidated the consent of the holders of 75 per cent. of these bonds will be required. The New York Central proposes to offer to the consenting bondholders the privilege of exchanging their 3½ per cent. bonds par for par for 4 per cent. bonds to be issued under and secured by a new mortgage on the railroads of the New York Central, including the lines recently consolidated. The total amount of bonds under this new mortgage will not exceed $167,102,400. The plan also includes the execution of another new mortgage, to be called the refunding and improvement mortgage, secured upon the same property as the first new mortgage, but subordinate to it, and upon such other property as the directors may determine to include thereunder. Under this improvement mortgage bonds may be issued for additions and betterments, to refund the short term notes and to provide for other general purposes.

Pittsburgh & Susquehanna.—This property will be sold on June 2, at Osceola Mills station on the line of the road. The road runs from Philipsburg, Pa., to Fernwood, 20 miles.

St. Louis & Cairo.—See Mobile & Ohio.